EVALUTION OF BINARY SIMULATED KALMAN FILTER AND ITS APPLICATION ON AIRPORT GATE SCHEDULING

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This thesis is submitted as partial fulfilment of the requirements for the award of the Bachelor of Electrical Engineering (Hons.) (Electronics)

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This thesis specially dedicated to my beloved parents and all my family for all the encouragement and supports which without it I might not have reached this far.

Mohamad Nor Bin Mamat & Siti Hasiah Binti Mahmood

Mohd Nazri & family, Rahimin & family, Norafidah & family, Nani Sharezan & family, Zaidi & family, Rahilah & family, Norsadira & family, Siti Masniza.

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ABSTRACT

Airport gate allocation problem referred to the search for optimal assignment of flights to gates at an airport. Assignment of flight to gates becomes very complex nowadays, especially for a big size airport. SKF is an optimization that has been introduced recently. This algorithm is based on mechanism of Kalman Filter where every agent estimates the global minimum/maximum. SKF can only solve continuous numerical optimization problem. From this algorithm, enhancement and modification of SKF is introduced. Exploitation of the distance between an agent and the best agent let the SKF operates in binary search space. In this study, the airport gate allocation problem is solved using extended version of Simulated Kalman Filter algorithm called Binary Simulated Kalman Filter (BSKF).The main objective of this study is to minimize the total walking distance of passengers either from a gate to entrance/exit or gate to a gate. So, a small case study in an airport with 40 flights, 14 numbers of planes and 16 gates has been chosen and for evaluate BSKF, fix parameter of run, iteration and number of agents was set up.

ABSTRAK

Masalah penetapan pintu lapangan terbang dirujuk kepada tugasan untuk mengurangkan penerbangan ke pintu di lapangan terbang. Tugasan penerbangan kapal terbang ke pintu menjadi sangat kompleks dari hari ke hari, terutama bagi sebuah lapangan terbang yang mempunyai saiz yang besar. SKF adalah pengoptimuman yang telah diperkenalkan baru-baru ini. Algoritma ini adalah berdasarkan kepada mekanisme penapis Kalman di mana tiap-tiap ejen menganggarkan minimum / maksimum global. SKF hanya boleh menyelesaikan masalah pengoptimuman berangka yang berterusan. Dari algoritma ini, peningkatan dan pengubahsuaian SKF diperkenalkan. Eksploitasi jarak antara ejen dan ejen yang terbaik membiarkan SKF beroperasi dalam ruang carian binari. Dalam kajian ini, masalah penetapan pintu lapangan terbang diselesaikan menggunakan versi sambungan daripada simulasi Kalman Filter algoritma dipanggil Simulasi Binari Kalman Filter (BSKF). Objektif utama kajian ini adalah untuk mengurangkan jarak berjalan kaki jumlah penumpang sama ada dari pintu ke pintu masuk / keluar atau pintu ke pintu. Jadi, satu kajian kes kecil di sebuah lapangan terbang dengan 40 penerbangan, 14 bilangan pesawat dan 16 pintu telah dipilih untuk menilai BSKF, menetapkan parameter larian, lelaran dan beberapa ejen telah ditetapkan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AGAP	Airport Gate Allocation Problem
SKF	Simulated Kalman Filter
BSKF	Binary Simulated Kalman Filter
PEN	Penang
BKI	Kota Kinabalu
KCH	Kuching
KUL	Kuala Lumpur
PSO	Particle Swarm Optimization
GSA	Gravitional Search Algorithm
Xbest	The best fitness value
Xtrue	The best-so-far solution

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Nowadays, the assignments of flights to gates have become very complex due to increased number of flights and had cause increasing in air traffic. Growing flights congestion has made it necessary to find the best solution in order to improve the efficiency of airport operations, such that efficiency in the scheduling arrangement of the arriving and departing flights. The quality of airport performances can be measure by passenger's comforts, thus the smooth and optimal flow of passengers from the check in counters to embarkation of disembarkation gates at the airport is based on how the system of the airport is managed. In airports, gate assignment problem (AGAP) is one of the important operations that had to conduct in order to overcome this complexity. The objective of this task is assigning each flight to an available gate by reducing the total walking distances of passengers. Thus, the suitable process used is optimization in order to optimize the gate usage in the airport gate scheduling. Therefore, in solving the limitation and problems, mathematical modelling becomes very useful in the application of this study. The Binary Simulated Kalman Filter (BSKF) is an algorithm that I have used to solve this problem.

1.2 BACKGROUND OF STUDY

Optimization methods are very useful in solving complicated problem that were implementing in the real world application such as in solving airport gate assignment problem which is optimization in allocation of gates and runway. There are many advantages of the optimization of airport gate scheduling. One of the advantages is reduce flight taxiing time. Moreover, it also can improve the operating efficiency of the airport and at the same time it able to reduce flight delay thus, reduce the airline operating costs. Therefore, the sliding blockage, in these cases is not considered because every flight has different taxiing time based on the different allocations to the gate and runway

combination. In example, the distances traversed by passengers from check in counters to gates and then from gate to gate in circumstances of transferring or connecting flights. So, this had shown how the scheduled flights are allocated to gates, and to get minimize walking distance by assign the best gates for the flight in that airport. Figure1.0 shows the example layout in airport.

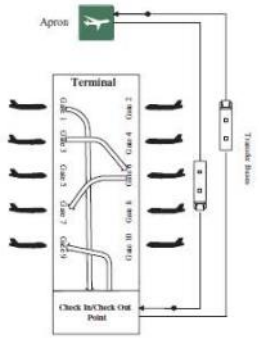

Figure 1.1 : Example layout in airport

Source: H. Ding, A. Lim, B. Rodrigues and Y. Zhu (2004)

Therefore, in order to solve this airport gate allocation problem, an algorithm is used which is Binary Simulated Kalman Filter (BSKF). Algorithm is a process or set of rules that use computer or electronic device to solve the operation and the calculation for the problem's function. Therefore MATLAB's software is used to make sure this project research and experimental for this case study going success.

In AGAP, Kuala Lumpur International airport (KLIA) and Air Asia Airline's flight schedule are chosen as the references and preferable for this case study. For this research, the facilities, utility and also system should be fully utilized and optimized. Through this, man power or worker can be saving.

1.3 PROBLEM STATEMENT

The problem is in assigning gates for flights with different situations such as arrival, departure, connection, and intermediate parking flight and so on. This will cause

passengers to walk a long distance from the boarding bridge to entrance / exit gate or vice versa.

1.4 OBJECTIVE OF STUDY

The primary objective of this project is to design an optimization algorithm for assigning each flight to an available gate so that it can reduce the total walking distance of passengers.

1.5 SCOPE OF STUDY

This study focuses on optimization by using Binary Simulated Kalman Filter (BSKF) algorithm. It involves daily airport operations such as gate allocations, flight schedules and so on. BSKF will be use to get the best solution in solving the airport gate allocation problem by make simulation in MATLAB software.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter starts with optimization in solving problems, overview of BSKF algorithm and its application in airport gate scheduling. Better understanding about the project was gained through the literature study.

2.2 AIR TRANSPORTATION IN MALAYSIA

2.2.1 CIVIL AVIATION

The primary role of the Air Transport Division is to promote a sustainable, economic and efficient air transport industry. This is same like the previous study on an overview of Urban Transport in Malaysia, which urban cities developing countries have several factors that create a problem to a sustainable transport system. The population growth of cities and urbanization has to lead an increase in travel demand. From this sector it may contribute large to which is MYR 7.3 billion (1.1%) to Malaysia GDP. The total comprises value as shown below:

- MYR 3.2 billion directly contributed through the output from the aviation sector (Airlines, airports and ground services);
- MYR 2.6 billion indirectly contributed through the aviation sector's supply chain; and
- MYR 1.6 billion contributed through the spending by the employees of the aviation sector and its supply chain.

· In addition, there are a MYR 17.2 billion in 'catalytic' benefits through tourism, which raise the overall contribution to MYR 24.5 billion or 3.6% of GDP.

Source: Benefit of aviation Malaysia (2011)

Figure 2.1 and figure 2.2 shows the connectivity of Malaysia's cities with major cities and markets around the world and the foreign direct investment and connectivity to Malaysia.

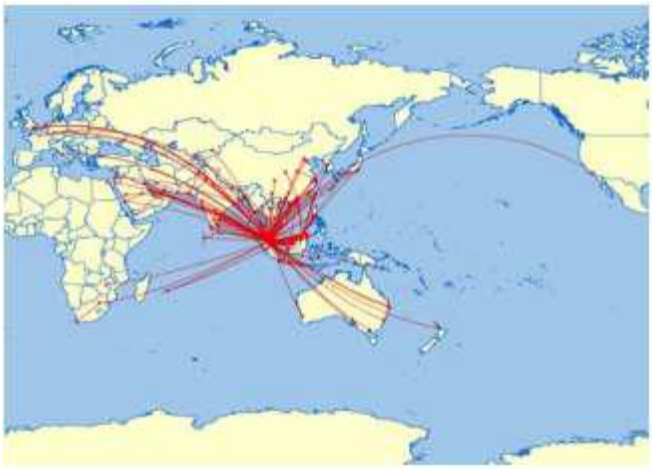

Figure 2.1 : The connectivity of Malaysia to the other cities around the world

Source: IATA

2.2.2 AIRPORT IN MALAYSIA

From Department of Civil Aviation Malaysia that using Integrated Aeronautical Information Package it shows that Malaysia has almost 118 airports and 38 of that are paved. Malaysia Airlines providing international and domestic air services. Major international routes and domestic routes crossing are between East and West of Malaysia which are served by Malaysia Airlines (MAS), Air Asia and Malindo Air. While for the domestic, routes are enhanced by small airlines such as MasWINGS, Firefly and Berjaya Air. As mentioned in introduction before, Kuala Lumpur International Airport is the main busiest airport of Malaysia and in 2014 international passenger traffic reported, it was on 13th busiest airport in the world which 25.4 million international passenger traffic use it. The domestic route maps by different airlines can be analyzed as the figure

2.2 below and from that Penang International Airport is second largest urban area, which had over 5.4 million passengers in 2013.

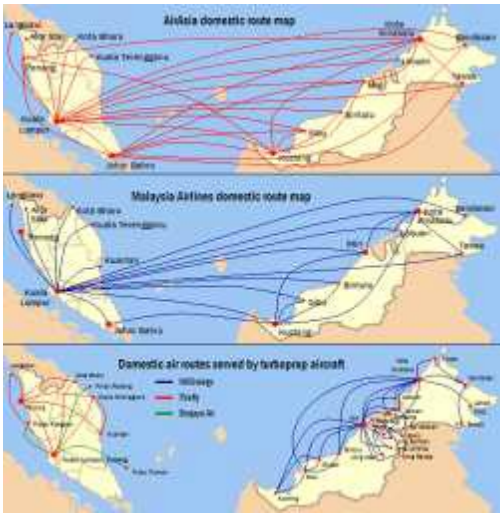

Figure 2.2 : The domestic route with different airlines

Source: Benefit of aviation Malaysia (2011)

2.3 OPTIMIZATION USING SELECTED ALGORITHM

The best use of the gate to the airport is very important due to increase the profit for the airlines, reduce the inefficient airport operation, and increase the safety in an airport. Therefore, the ideal uses of the gate will produce the better operation and system for the airport. Efficient airport operation depends on gating aircraft for a smooth flow of arriving and departing flights (Lim, A., & Wang, F. (2005, November). The fully utilize gate will increase the number of flight depart, and the total walking distance for all pasenggers will reduce. Thus, the optimization is very important due to competition among the people around the world to get best profit.

2.3.1 OPTIMIZATION

Optimization can be defined as a finding the best candidate from a set of alternatives without specific count or number and evaluate all possibles alternatives. It is a root of engineering to design a new product that produces an efficient system for better solution and able to reduce the operational cost. Nowadays, the optimization algorithm are use to find the minimum solutions of mathematical function that are worldwide use in engineering and at the same time able to satisfy the constraints

Optimization had several of type, categories and purpose of usage. For this research, the scope of optimization will wind down to discrete combinatorial optimization. Discrete can be defined as separate or distinct while combinatorial is relating, involving elements or properties. When both discrete and combinatorial are combined, it brings out the theory for a system that can produce an infinite number of combination from a set of finite number or discrete elements. In shorts, optimization is made up of maximizing or minimizing a real function by analytical choosing input values from the set of data and calculating the value in the function.

2.3.2 TYPE OF ALGORITHM

In optimization, discrete combinatorial takes up continuous elements such as Particle Swarm Optimization (PSO), Gravitational Search Algorithm (GSA), and Simulated Kalman Filter (SKF) as in the tree diagram in figure 2.2 above. By modifying them with adding flexibility and allowing diversity of problems that can be solved by adding of binary, multi-state, multi-objective, distance evaluated, and simulated essentially enhance and upgrading the original distinct continuous algorithms. It is making them more capable of solving more complex problems. For example, the original GSA where it is designed to be operational in real space, concerning with real values' vectors (Rashedi, E., Nezamabadi-Pour, H., & Saryazdi, S. (2010) .However, most optimization matters are in terms of binary search space. Therefore, they need to upgrade the original GSA. The upgrade is planned and brought into testing by experimenting with the benchmark functions to determine the ability of Binary GSA and how it performed against different problems given.Similar in PSO, which it need to modify into Binary

for the suitable problem. The use of sigmoid function or probabilistic function as figure 2.3 below as a mapping function suggests a tolerance for the PSO to operate in binary search space. In order to solve discrete optimization problems in SKF, an enhancement is needed. For this research, the SKF algorithm is extended for solving combinatorial optimization problem. Similar to previous study, a mapping function enable the SKF algorithm to operate in binary search space.

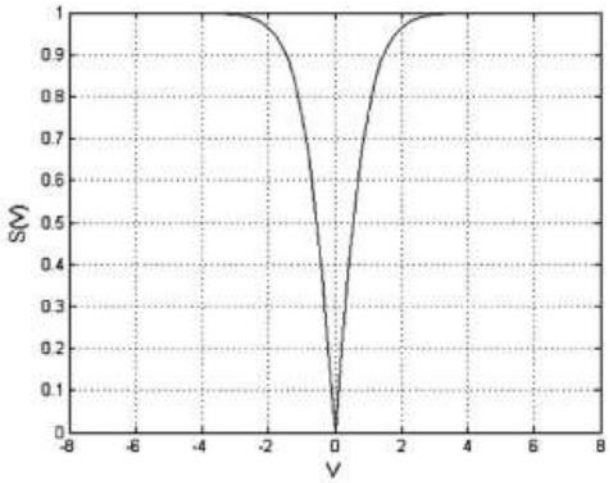

Figure 2.3 : Probabilistic function

Source: Rashedi, Nezamabadi & Saryazdi, 2010

2.3.3 OVERVIEW OF SKF

One of the examples of meta-heuristic algorithm that were originally developed to operate in binary search space is Simulated Kalman Filter (SKF). It had been introduced by Ibrahim *et al.* in 2005 (Yusof, Z., Ibrahim, I., Satiman, S. N., Ibrahim, Z., Aziz, N. A., & Ab Aziz, N. A. (2015). SKF is a population-based optimization algorithm that is inspired by the estimation capability of Kalman Filter. SKF stimulates the measurement process as individual agent's update mechanism in estimate the optimum without tied up to any distribution by acting as feedback givers. Figures 2.4 below show the flowchart of SKF in order to get the value of the best-so-far solution, xtrue.

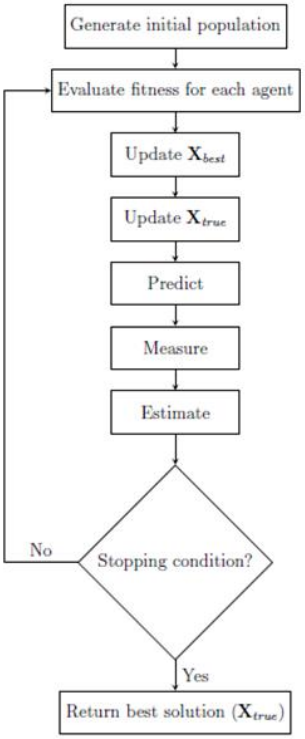

Figure 2.4 : SKF Flowchart

2.3.4 DESCRIPTION TERMINOLOGIES OF SKF

Agent (X): It is a candidate solution representation. At time t the *ith* agent *Xi* (t) can be described as *Xi* (t) = [X*i1*(t), X*i2*(t),…… X*in*(t)], where X is the optimized parameters, and X*in*(t) is the position of the *ith* particle with respect to the *ith* a dimension; the value of the *ith* optimized parameter in the *ith* candidate solution.

Xbest: The best fitness value to its position associated with *ith* agent in which that the best position that the agent finds the highest fitness value fot that agent.

Xtrue: the best-so-far solution associated with *ith* agent that any agent has stopped at the highest fitness value. This represents the best fitness of the entire agent at any point of time. The optimization process uses a number of agents that moves around a pre-defined search space looking for the best solution.

2.3.5 BSKF

In BSKF, most calculation is similar to the original SKF. Modifications are needed only during initialization and generation of solution to combinatorial optimization problem. (Yusof, Z., Ibrahim, I., Satiman, S. N., Ibrahim, Z., Aziz, N. A., & Ab Aziz, N. A. (2015). During the initialization of agents, a random bit string $\sum i$ is generated for each agent. Each bit in the bit string is referring to a dimension. The length of the bit string is problem dependent and subjected to the size of the problem. A function shown in figure 2 is used to map a velocity value into aprobilistic value within interval 0 to 1. Similar function in this BSKF study, the term Δi is mapped to a probabilistic value within interval [0, 1] using a mapping functions as follows:

$$S(\Delta i(t)) = |\tanh \Delta i(t)| \tag{2.1}$$

After S(Δi(t)) is calculated, a random number, *rand*,is generated and a binary value at dimension d of an *ith* agent is updated according to the following rule:

$$rand < S(\Delta i(t))$$

$$\text{then } \sum_i^d (t+1) = \text{complement } \sum_i^d (t+1) \tag{2.2}$$

$$\text{else } \sum_i^d (t+1) = \sum_i^d (t+1) \tag{2.3}$$

Where 1 means this feature is selected as a required feature for the next renewal, 0 means this feature is not selected as a required feature for the next renewal, and *rand*(t) is a random value in the range [0:1].

2.4 APPLICATION OF BSKF IN AIRPORT GATE SCHEDULING

The case study on Binary Simulated Kalman Filter for airport gate allocation problem (AGAP) we must consider very wide factors that affect the efficiency to the airport operation. There are many factor or problem statements for these cases such the time available for departure, allocation of departure capacity, the distance to walk from departure to the gate, distance the runway to the gate and so on. The increase of air traffic has brought problems for unprepared airports. The number of air traffic also means that the efficiency of the airports' system to arrange everything is required to be at the

top level because the increasing of human population by each year, the number of people that are able to afford flight tickets followed. Efficient airport operation depends on gating aircraft for a smooth flow of arriving and departing flights (Lim, A., & Wang, F. (2005, November). So, the purpose of optimization is to apply for an airport gate allocation field by using mathematical function and MATLAB software. The objective is to solve the problem and come out with an optimize result based on the average best fitness, convergence curve and total walking distance

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

In this chapter, overall procedure of running the project is described. Methods and equation used in solving the Airport Gate Allocation Problem using BSKF are explained. An objective function used for this AGAP case study was introduced.

3.2 EXPERIMENT OF SKF USING MATLAB

Parameters:

Maximum run, run max = 50

Maximum iteration, tmax = 20

Number of agents, N = 100

Number of dimensions, n = 50

Figure 3.1 : Input data for SKF

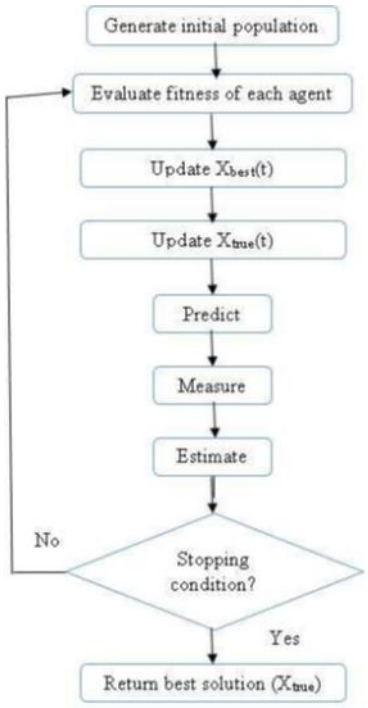

Figure 3.2 : Flow Chart of SKF

3.3 BSKF FLOWCHART

In BSKF, there is a specific way to assess the properties of solution for bench-mark functions that are used. Every particle is considered as a position in a dim-dimensional space and every element of a particle's position ca take the binary value of 0 or 1 which is 1 means included while 0 is excluded. Every element can change from 0 to 1 and vice versa. Stopping condition can be the maximum number of iterations or finding an acceptable solution. Figure 3.3 below shows the flowchart of BSKF. The objective of this algorithm is to find the best solution which is the best fitness value. Start with generate random flight-gate matching for each agent and the output is the best fitness solution

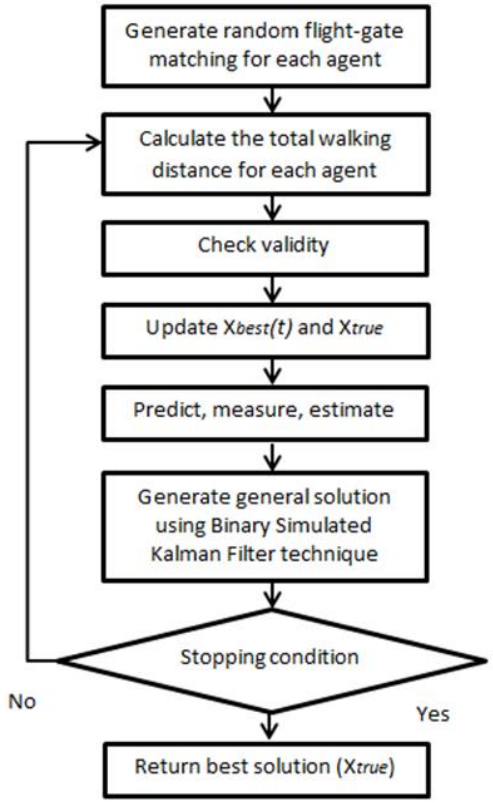

Figure 3.3 : Flow chart of BSKF

BSKF is the upgrading from the SKF. Based on the concept of BSKF, initially it will start by generate random flight-gate matching for each agent. For xbest and xtrue, it is same as SKF when the initial random flight-gate was generated, the fitness of each agent was evaluated. Then, while stopping criteria are not satisfied the xbest and xtrue of the agent, it will be going to the next iteration until meet the stopping criterion. Lastly, when the xbest and xtrue update the fitness value for each agent can be evaluated, the output can be result as the best solution.

3.3.1 INITIALIZATION

Generate initial value of X according to the number of agent, N and the number of bits, n. The number of agents and number of bits can be set. Then, the value of X can be calculated randomly by using MATLAB's software. Thus, the value of different X can be calculated. The random value for this case is between 0 and 1. Initial value for BSKF as equation 3.1 below.

$$X = \{1, (N, \dim) > 0.5$$
$$0, (N, \dim) < 0.5 \quad (3.1)$$

3.3.2 UPDATE THE VALUE OF XTRUE AND XBEST

To update the value of Xbest, the best agent among different agent is by comparing the fitness with previous best agent. If the present fitness value is better than the previous value, then the previous xbest location will be substitude with current location.

Then, to update the value of Xbest, which is the optimum solution. Xbest value must be compared from previous value of best agent with previous fitness iteration for the next iteration. Then, the best agent at that iteration will be as the Xbest so far. The best agent fro any iteration will be the final Xbest until all the iteration is done.

3.3.3 STOPPING CRITERION

Observe whether the condition is satisfied, then stop the iteration and that fitness is the best solution which is Xbest. Otherwise, it will repeatedly evaluate fitness until meeting the stop criterion.

3.3.4 BEST SOLUTION

Return best solution is the best value of best fitness which we need, minimum or maximum. It depends on the set from the initial set and for the final, it will display the value of the best solution for the fitness.

3.3.5 MATLAB IMPLEMENTATION

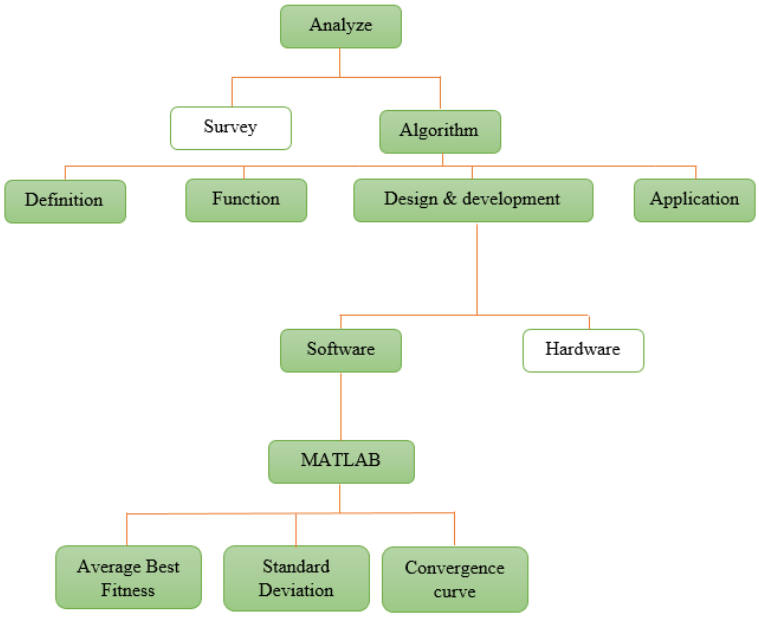

Figure 3.4 : Flow chart for the software

In this research, the software used is MATLAB.MATLAB is used for numerical computation, visualization, and programming that in a high-level language and interactive environment. By using MATLAB, the data can be can analyze, develop algorithms, and create models and applications. The language, tools, and built- in math functions enable you to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming languages, such as C/C++ or Java®. MATLAB also has a wide range of applications, including signal processing and communications, image and video processing, control systems, test and measurement, computational finance, and computational biology. This MATLAB already develops and well-known for more than a million engineers and scientists in industry and academia and the language of technical computing. So, MATLAB software is used to develop the best result of optimization.

3.4 AIRPORT GATE ALLOCATION PROBLEM

The AGAP for this case comprises a few parameters such as:

n: Number of flights

m: Number of gates

Below is the objective function for AGAP and the objective is to minimize the total walking distance between gates to entrance/exit or gate to another gate (transit) corresponding to the number of passengers.

$$TWD = \left(\sum_{i=1}^{c=31} W_e P_e + W_{pen} P_{pen} + W_{kbk} P_{kbk} + W_{kch} P_{kch} \right) + \left(\sum_{i=1}^{d=9} W_{e1} P_{e1} \right) \quad (3.2)$$

Where :

c = number of flights codes

d = number of first flight

we = walkig distance between the gate assigned and gate transits (PEN)

wkbk = walking distance between the gate assigned and gate transits (KBK)

wkch = walking distance between the gate assigned and gate transits (KCH)

fe = number of passenger walk from the gate assigned to entrance

fpen = number of passenger walk from the gate assigned to gate transits (PEN)

fkbk = number of passenger walk from the gate assigned to gate transit (KBK)

fkch = number of passenger walk from the gate assigned to gate transit (KCH)

The equation indicates that when a flight arrived at an assigned gate, the passengers just arrived will have to walk from the arriving gate to the entrance/exit while the transit passenger will assigned to the next gate. Thus, the formula above functions by minimizes the passenger's walking distance to an available gate respectively.

3.4.1 DATA FOR AGAP

In this case study, the small scales of three airports and less than 200 passengers in one flight are used. Three airports that involve in this case study are flights from Penang (PEN), Kuching (KCH) and Kota Kinabalu (KBK) to International Kuala Lumpur Airport (KUL).

Table 3.1 : Depart time from Penang

DEPART (KUL)	ARRIVE (PEN)	FLIGHT NO
07:15	08:10	F0403
08:15	09:10	F0103
10:00	10:55	F0302
12:50	13:45	F0202
14:35	15:30	F0102
15:45	16:45	F0404
17:00	17:55	F0303
19:35	20:30	F0405
21:00	21:55	F0104
22:00	22:55	F0203

Table 3.2 : Arrive time from Penang

DEPART (PEN)	ARRIVE (KUL)	FLIGHT NO
06:50	07:50	F0300
08:35	09:35	F0200
11:20	12:20	F0100
13:10	14:10	F0400
14:10	15:10	F0301
17:10	18:10	F0401
18:20	19:20	F0101
19:25	20:25	F0201
20:55	21:55	F0402
23:30	00:20	F0102

Table 3.3 : Depart time from KBK

DEPART (KUL)	ARRIVE (BKI)	FLIGHT NO
06:30	09:05	F0702
07:50	10:30	F0602
09:30	12:05	F0502
10:20	12:55	F0902
12:50	15:20	F0802
15:35	18:10	F0703
16:25	19:00	F0603
17:10	19:45	F0503
18:35	21:05	F0903
21:25	23:59	F0803

Table 3.4 : Arrive time from KBK

DEPART (BKI)	ARRIVE (KUL)	FLIGHT NO
07:10	09:40	F0800
09:30	12:10	F0700
10:55	13:25	F0600
12:30	15:00	F0500
15:45	18:15	F0900
18:30	21:00	F0801
18:55	21:25	F0701
19:25	21:55	F0601
20:10	22:45	F0501
21:30	23:59	F0901

Table 3.5 : Depart time from Kuching

DEPART (KCH)	ARRIVE (KUL)	FLIGHT NO
07:00	08:45	F1000
09:20	11:00	F1100
10:40	12:25	F1200
11:55	13:45	F1300
15:05	16:45	F1001
16:15	17:55	F1101
17:35	19:20	F1201
18:30	20:15	F1301
19:10	21:00	F1400
19:45	21:25	F1102
22:50	00:50	F1202

Table 3.6 : Arrive time from Kuching

DEPART (KUL)	ARRIVE (KCH)	FLIGHT NO
07:10	08:55	F1103
08:30	10:15	F1203
09:45	11:30	F1302
12:55	14:40	F1002
14:10	15:50	F1102
15:25	17:10	F1202
17:35	19:20	F1302
18:30	20:10	F1003
20:15	21:55	F1104
21:25	23:10	F1203

The table shown above are three different flights that are considered in this case study which is flight arriving from Penang, Kota Kinabalu and Kuching and departing from KLIA. The flight information was retrieved from Air Asia Airline's website (http://www.airasia.com/kh/en/where-we-fly/flight-schedule.page). In this case study, the number of plane, *n* is set as 14, while the number of gates, *m* is set as 16 and almost 31 flight and 9 flight as first flight per day. Another parameter that had to be considered is the distance between assigned gate to entrance/exit and distance between gate to another gate and also the number of passenger in every flight which is depart or arrive. The airport layout illustration in this case study as in figure below. The distance between the gate to entrance/exit through the gate as in the table and the number of passenger in every flight depart and arrive as in the table below.

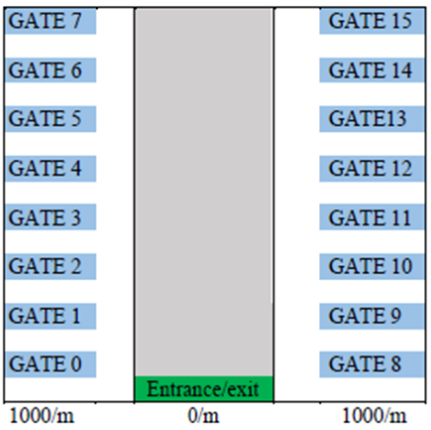

Figure 3.5 : Airport layout illustration

Table 3.7 : Distance gate to entrance/exit

GATE	DISTANCE
0	1091.5
1	1328.8
2	1650.0
3	2015.6
4	2405.2
5	2809.0
6	3221.6
7	3640.1
8	1091.5
9	1328.8
10	1650.0
11	2015.6
12	2405.2
13	2809.0
14	3221.6
15	3640.1

Table 3.8 : Number of passenger for each flight

NO	FLIGHT'S CODE	PASSENGER
1	F0300	200
2	F0200	200
3	F0100	200
4	F0400	200
5	F0301	200
6	F0401	200
7	F0101	200
8	F0201	200
9	F0402	100
10	F0102	100
11	F0102	100
12	F0701	100
13	F0800	200
14	F0700	200
15	F0600	200
16	F0500	200
17	F0900	200
18	F0801	200
19	F0701	150
20	F0601	100
21	F0501	100
22	F0901	100
23	F0601	100
24	F0501	100
25	F0901	100
26	F1301	100
27	F1000	200
28	F1100	200
29	F1200	200

Table 3.9 : continued

29	F1200	200
30	F1300	100
31	F1001	200
32	F1101	200
33	F1201	200
34	F1301	100
35	F1400	100
36	F1102	100
37	F1202	50
38	F1400	100
39	F1102	100
40	F1202	100
TOTAL PASSENGER		6000

CHAPTER 4

RESULT AND DISCUSSION

4.1 INTRODUCTION

This chapter comprises the analysis presentation and interpretation of the findings for overall research.

4.2 AGAP USING BSKF

4.2.1 PARAMETER USED

To achieve the main objective of this research is solving airport gate allocation by using Binary Simulated Kalman Filter. In this case study, the small scale of parameter is used. The population size or known as agents is set to 200 (N=200), the number of bits, n set as 124 based on the 31 flight times with 4 bits and exclude the first flight. The maximum number of agents, N and maximum iteration, max iteration set as 200 and 4000 respectively. Thus, an average best-so-far solution of the last iteration is recorded.

4.2.2 FITNESS VALUE BY COMPARING DIFFERENT ITERATION

Figure 4.1 and figure 4.2 shows the different pattern of curve and fitness value which is xbest by changing the number of iterations by using the same number of agents which is 200 agents.

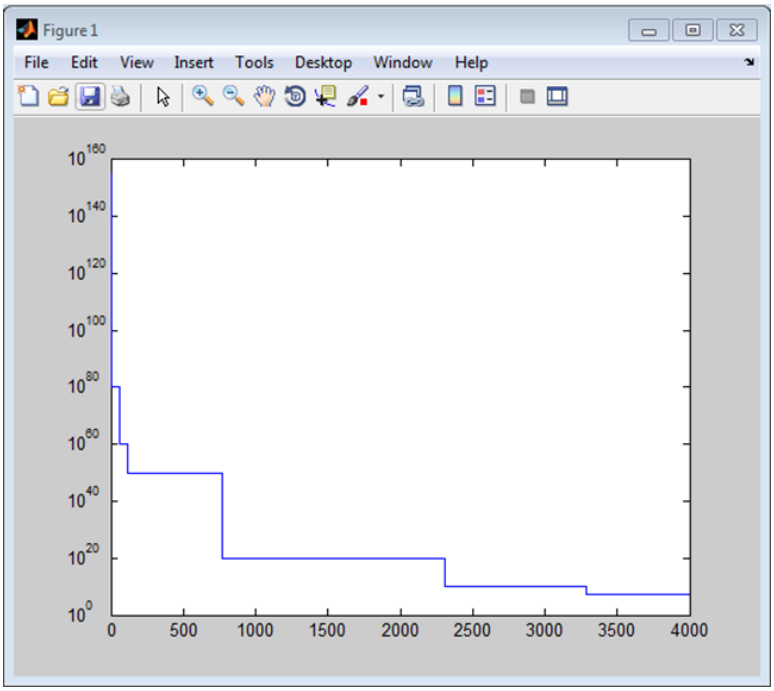

Figure 4.1 : Convergence curve with 4000 iterations for AGAP using BSKF

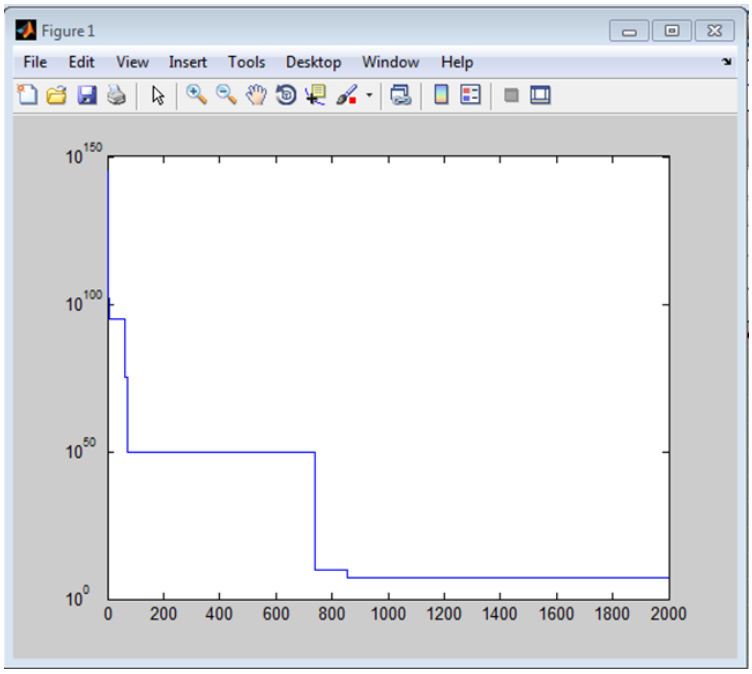

Figure 4.2 : Convergence curve with 2000 iterations for AGAP using BSKF

Based on the changing iteration for AGAP parameter, there is difference of fitness value gain. The results shows that when the iteration is higher, the better number of fitness value will be formed. As shown in Figure 4.1 and 4.2 above the 4000 iteration has the better fitness which is 12,553070while for 2000 iterations, the fitness value is

12,775938. Therefore, the better fitness is depending on the iteration that is used in order to get precise result.

4.2.3 IMPLEMENTATION TO AGAP

The calculation of total walking distance between assigned gate to entrance/exit and between gate to another gate which is transit were represents the fitness calculation which is required as one of the procedures in the flow of solving the AGAP using BSKF. The objective function for solving this problem is to reduce total walking distance of pasengger. The result of airport gate schedule for 14 planes, 16 gates and 40 flights with specific time window was recorded. The time window for all the flight was referring to the real data from domestic flight schedule at Air Asia Company as in chapter 3 above. The validity checking of the flight-gate assignment is very important in this case study which is to prove the flights assigned to the gates are valid and at the same time, make sure there are no clash of flights at gate. Table 4.1 Parameters setting of BSKF below shows the parameter setting in solving Airport Gate Allocation Problem.

Parameters	Value
Agents	200
Iteration	4000
Error covariant, P	1000
Process noise, Q	0.5
Measurement noise, R	0.5

Table 4.1 : Parameters setting of BSKF

4.2.4 THE VALIDITY TABLE

No	Flight	Flight Code	Gate Assigned
1	PEN	F0300	14
2	PEN	F0200	6
3	PEN	F0100	9
4	PEN	F0400	1
5	PEN	F0301	8
6	PEN	F0401	2
7	PEN	F0101	15
8	PEN	F0201	6
9	PEN	F0402	14
10	PEN	F0102	0
11	KBK	F0800	1
12	KBK	F0700	5
13	KBK	F0600	12
14	KBK	F0500	10
15	KBK	F0900	1
16	KBK	F0801	5
17	KBK	F0701	10
18	KBK	F0601	2
19	KBK	F0501	8
20	KBK	F0901	4
21	KCH	F1000	13
22	KCH	F1100	3
23	KCH	F1200	0
24	KCH	F1300	11
25	KCH	F1001	4
26	KCH	F1101	13
27	KCH	F1201	7
28	KCH	F1301	12
29	KCH	F1400	11
30	KCH	F1102	9
31	KCH	F1202	1

	6am	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm	8pm	9pm	10pm	11pm	12am
		14	14	14	14	14													
				6	6	6	6												
							9	9	9	9									
									1	1	1								
										8	8	8	8						
													2	2	2				
														15	15	15	15		
															6	6	6	6	
																14	14	14	14
																			0
				1	1	1	1	1											
						5	5	5	5	5	5								
								12	12	12	12	12							
									10	10	10	10	10						
													1	1					
															5	5	5		
																10	10	10	10
																2	2	2	2
																	8	8	8
																		4	4
			13	13	13	13	13	13	13	13									
					3	3	3	3	3	3	3	3							
							0	0	0	0	0	0	0						
								11	11	11	11	11	11	11					
											4	4	4	4	4				
												13	13	13	13				
														7	7	7	7	7	
															12	12	12	12	12
																11	11	11	11
															9	9	9	9	9
																			1

No	Flight	Flight Code	Gate Assigned
1	PEN	F0402	3
2	PEN	F0102	4
3	KBK	F0701	10
4	KBK	F0601	7
5	KBK	F0501	8
6	KBK	F0901	12
7	KCH	F1301	1
8	KCH	F1102	2
9	KCH	F1202	15

	6am	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm	8pm	9pm	10pm	11pm	12am
	3	3	3																
	4	4	4	4															
	10	10																	
	7	7	7																
	8	8	8	8	8														
	12	12	12	12	12	12													
	1	1	1																
	2	2	2	2	2														
	15	15	15	15	15														

	6am	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm	8pm	9pm	10pm	11pm	12am
SUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 4.3 : Validity table represent the solution in excel

In the Figure 4.3 above, the gates was assigned by BSKF and 31 flights include with 9 first flight that had been assign earlier which will be occupying 16 gates as assigned between 06.00 to 00.00 without any clash occurs. This situation is called as valid for the gate assignment when the sum of validity is equal to 0. Meanwhile, a single invalidity of gate assignment is enough for the solution to be irrelevant to the application of gate schedule.

4.2.5 SCHEDULE FOR AIRPORT GATE ALLOCATION PROBLEM

A complete schedule for 40 flights with their gate assigned by BSKF is shown in figure 4.4. From this schedule the 15 different colour are used to represent the number of plane for 40 flight codes or known as Time Window (TW). The 9 first flights are already assigned their colour with grey colour at their time windows.

	GATE 0	GATE 1	GATE 2	GATE 3	GATE 4	GATE 5	GATE 6	GATE 7	GATE 8	GATE 9	GATE 10	GATE 11	GATE 12	GATE 13	GATE 14	GATE 15
6:00																
7:00											TW34				P3 (TW1)	
8:00		TW38		TW32				TW35						P10(TW21	P3	
9:00		P8 (TW11)	TW39		TW33		P2 (TW2)							P10	P3	
10:00		P8		P11(TW22			P2		TW36					P10	P3	TW40
11:00		P8		P11		P7 (TW12)	P2						TW37	P10	P3	
12:00	P12(TW23	P8		P11		P7	P2			P1 (TW3)				P10		
13:00	P12	P8		P11		P7				P1		P13(TW24	P6(TW13)	P10		
14:00	P12	P4 (TW4)		P11		P7				P1	P5(TW14)	P13	P6	P10		
15:00	P12	P4		P11		P7			P3(TW5)	P1	P5	P13	P6	P10		
16:00	P12	P4		P11	P10(TW25	P7			P3		P5	P13	P6			
17:00				P11	P10				P3		P5	P13	P6	P11(TW26		
18:00		P9 (TW15)	P4(TW6)		P10				P3		P5	P13		P11		
19:00		P9	P4		P10			P12(TW27)				P13		P11		P1(TW7)
20:00			P4		P10	P8(TW16)	P2(TW8)	P12		P10(TW30			P13(TW28	P11		P1
21:00			P6 (TW18			P8	P2	P12		P10	P7(TW17)	P14(TW29	P13		P4(TW9)	P1
22:00			P6			P8	P2	P12	P5(TW19)	P10	P7	P14	P13		P4	P1
23:00			P6		P9(TW20)		P2	P12	P5	P10	P7	P14	P13		P4	
24:00:00	P11(TW10	P12(TW31	P6		P9				P5	P10	P7	P14	P13		P4	

Figure 4.4 : The solution representation for Airport Gate Scheduling

PLANE NO	REPRESENT
P1	
P2	
P3	
P4	
P5	
P6	
P7	
P8	
P9	
P10	
P11	
P12	
P13	
P14	
1ST PLANE	

Figure 4.5 : Colour representations for plane in Airport Gate Scheduling

From the solution representation above, the gates are fully used and the BSKF had assigned the best gate for every flight that depart to KLIA and arrive from KLIA. The gate near to entrance were the most frequent BSKF assigned such in gate 0 until 4 and 8 until 112, while gate 7 and 15 is the least for the plane landed the passenger to that gates. From this schedule, there are no clash planes for 40 Time Window either in validity table or in the schedule.

CHAPTER 5

CONCLUSION AND RECCOMENDATIONS

5.1 INTRODUCTION

This chapter will show the conclusion and recommendation due to the research and experiment that had done.

5.2 CONCLUSION

This project introduced the application of BSKF in solving airport gate allocation problem (AGAP) which is from extended Simulated Kalman Filter (SKF) algorithm. It can be used in solving combinatorial optimization problems such as Airport ; Gate Allocation Problem. Small scale problems which are consist of 14 numbers of planes, 16 gates and 40 flights include with transit problem. Simulation of BSKF shows that it is able to minimize the total walking distance for almost 6000 passengers a day from the gate to entrance/exit and to other gate which transit to the next destination. In short, the optimal matching between flight and gates can be obtained as in Chapter 4 and BSKF is the best algorithm in solving AGAP.

5.3 RECOMMENDATION

In this venture, there are a few recommendations and enhancements that can be improved for this research which is utilize greater measures of a problem with more flights and gates involve. Additionally, the changing of AGAP parameter, for example, less the quantity of operation entryway by shut certain door, reduce the time interim for the simulation to get better matching among gate and flight and ultimately, the real parameter utilized for this AGAP can be apply for the real contextual analysis later on.

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APPENDIX A

MATLAB CODING FOR AGAP USING BSKF

- Main.m

```
%max_iteration=2000;   % maximum iteration
max_iteration=4000;
N=200;                 % number of agents

input_data;            % number of passenger, gate distance etc

bskf;
```

- Bskf.m

```
n=124;      % number of bits

p=1000;
q=0.5;
r=0.5;

x=(rand(N,n))*200-100;
x_binary=rand(N,n)>0.5;

for iteration=1:max_iteration

   for ii=1:N

      validity_table(1:31,6:24)=0;
      validity_table(41,6:24)=0;

      S(1,:)=x_binary(ii,:);

      calculate_fitness;
      check_validity;

   end

   [bestVal,minIdx]=min(fit);
   x_best=x(minIdx,:);
   x_best_binary=x_binary(minIdx,:);
   best_validity=validity(minIdx,1);

   if iteration==1

      trueVal=bestVal;
```

```
    x_true=x_best;
    x_true_binary=x_best_binary;
    true_validity=best_validity;

elseif bestVal<trueVal

    trueVal=bestVal;
    x_true=x_best;
    x_true_binary=x_best_binary;
    true_validity=best_validity;

end

%predict
p=p+q;

%measure
for j=1:N

    y(j,:)=x(j,:)+(sin(rand(1,n)*2*pi)).*abs(x(j,:)-x_true);

  %  y(j,:)=x_binary(j,:)+(sin(rand(1,n)*2*pi)).*abs(x_binary(j,:)-x_true_binary);
end

%estimate
K=p/(p+r);
x=x+K.*(y-x);
p=(1-K).*p;

for j=1:N

    DDD=K.*(y-x);

end

BC=0;

for d = 1:N

    for l = 1:n

        rd = abs(tanh(DDD(d,l)));

        if rand()< rd

            x_binary(d,l) = xor(1,x_binary(d,l));
            BC=BC+1;

        else
```

```
            x_binary(d,l) = x_binary(d,l);

        end

    end

end

BC=(BC/(N*n))*100;

if BC<20

    x=(rand(N,n))*200-100;
    x_binary=repmat(x_true_binary,N,1);

end

convergence_curve(iteration)=trueVal;

%-----------display result at command window------------

iteration=iteration
walking_distance=trueVal
clashed_gate=true_validity

end

validity_table(1:31,6:24)=0;
validity_table(41,6:24)=0;
S(1,:)=x_true_binary(1,:);
calculate_fitness;
check_validity;
x_true_decimal=x_decimal;
true_validity_table=validity_table;

% clearvars -except x_true_binary x_true_decimal true_validity_table conver-
gence_curve
```

- Input_data.m

```
%---------------------- distance gate to entrance-------------------------

GATE_DISTANCE0=1091.5;
GATE_DISTANCE1=1328.8;
GATE_DISTANCE2=1650.0;
GATE_DISTANCE3=2015.6;
GATE_DISTANCE4=2405.2;
GATE_DISTANCE5=2809.0;
GATE_DISTANCE6=3221.6;
```

```
GATE_DISTANCE7=3640.1;
GATE_DISTANCE8=1091.5;
GATE_DISTANCE9=1328.8;
GATE_DISTANCE10=1650.0;
GATE_DISTANCE11=2015.6;
GATE_DISTANCE12=2405.2;
GATE_DISTANCE13=2809.0;
GATE_DISTANCE14=3221.6;
GATE_DISTANCE15=3640.1;


%------------------------distance gate to gate----------------------------

TRANSIT_DISTANCE(1,1)=0;
TRANSIT_DISTANCE(1,2)=437.5;
TRANSIT_DISTANCE(1,3)=875;
TRANSIT_DISTANCE(1,4)=1312.5;
TRANSIT_DISTANCE(1,5)=1750;
TRANSIT_DISTANCE(1,6)=2187.5;
TRANSIT_DISTANCE(1,7)=2625;
TRANSIT_DISTANCE(1,8)=2000;
TRANSIT_DISTANCE(1,9)=2047.3;
TRANSIT_DISTANCE(1,10)=2183.0;
TRANSIT_DISTANCE(1,11)=2392.2;
TRANSIT_DISTANCE(1,12)=2657.5;
TRANSIT_DISTANCE(1,13)=2964;
TRANSIT_DISTANCE(1,14)=3300.1;
TRANSIT_DISTANCE(1,15)=3657.7;
TRANSIT_DISTANCE(1,16)=3062.5;

TRANSIT_DISTANCE(2,1)=437.5;
TRANSIT_DISTANCE(2,2)=0;
TRANSIT_DISTANCE(2,3)=437.5;
TRANSIT_DISTANCE(2,4)=875;
TRANSIT_DISTANCE(2,5)=1312.5;
TRANSIT_DISTANCE(2,6)=1750;
TRANSIT_DISTANCE(2,7)=2187.5;
TRANSIT_DISTANCE(2,8)=2625;
TRANSIT_DISTANCE(2,9)=2047.3;
TRANSIT_DISTANCE(2,10)=2000;
TRANSIT_DISTANCE(2,11)=2047.3;
TRANSIT_DISTANCE(2,12)=2183.0;
TRANSIT_DISTANCE(2,13)=2392.2;
TRANSIT_DISTANCE(2,14)=2657.5;
TRANSIT_DISTANCE(2,15)=2964;
TRANSIT_DISTANCE(2,16)=3300.1;

TRANSIT_DISTANCE(3,1)=875;
TRANSIT_DISTANCE(3,2)=437.5;
```

```
TRANSIT_DISTANCE(3,3)=0;
TRANSIT_DISTANCE(3,4)=437.5;
TRANSIT_DISTANCE(3,5)=875;
TRANSIT_DISTANCE(3,6)=1312.5;
TRANSIT_DISTANCE(3,7)=1750;
TRANSIT_DISTANCE(3,8)=2187.5;
TRANSIT_DISTANCE(3,9)=2183.0;
TRANSIT_DISTANCE(3,10)=2047.3;
TRANSIT_DISTANCE(3,11)=2000;
TRANSIT_DISTANCE(3,12)=2047.3;
TRANSIT_DISTANCE(3,13)=2183.0;
TRANSIT_DISTANCE(3,14)=2392.2;
TRANSIT_DISTANCE(3,15)=2657.5;
TRANSIT_DISTANCE(3,16)=2964;

TRANSIT_DISTANCE(4,1)=1312.5;
TRANSIT_DISTANCE(4,2)=875;
TRANSIT_DISTANCE(4,3)=437.5;
TRANSIT_DISTANCE(4,4)=0;
TRANSIT_DISTANCE(4,5)=437.5;
TRANSIT_DISTANCE(4,6)=875;
TRANSIT_DISTANCE(4,7)=1312.5;
TRANSIT_DISTANCE(4,8)=1750;
TRANSIT_DISTANCE(4,9)=2392.2;
TRANSIT_DISTANCE(4,10)=2183.0;
TRANSIT_DISTANCE(4,11)=2047.3;
TRANSIT_DISTANCE(4,12)=2000;
TRANSIT_DISTANCE(4,13)=2047.3;
TRANSIT_DISTANCE(4,14)=2183.0;
TRANSIT_DISTANCE(4,15)=2392.2;
TRANSIT_DISTANCE(4,16)=2657.5;

TRANSIT_DISTANCE(5,1)=1750;
TRANSIT_DISTANCE(5,2)=1312.5;
TRANSIT_DISTANCE(5,3)=875;
TRANSIT_DISTANCE(5,4)=437.5;
TRANSIT_DISTANCE(5,5)=0;
TRANSIT_DISTANCE(5,6)=437.5;
TRANSIT_DISTANCE(5,7)=875;
TRANSIT_DISTANCE(5,8)=1312.5;
TRANSIT_DISTANCE(5,9)=2657.5;
TRANSIT_DISTANCE(5,10)=2392.2;
TRANSIT_DISTANCE(5,11)=2183;
TRANSIT_DISTANCE(5,12)=2047.3;
TRANSIT_DISTANCE(5,13)=2000;
TRANSIT_DISTANCE(5,14)=2047.3;
TRANSIT_DISTANCE(5,15)=2183.0;
TRANSIT_DISTANCE(5,16)=2392.2;
```

TRANSIT_DISTANCE(6,1)=2187.5;
TRANSIT_DISTANCE(6,2)=1750;
TRANSIT_DISTANCE(6,3)=1312.5;
TRANSIT_DISTANCE(6,4)=875;
TRANSIT_DISTANCE(6,5)=437.5;
TRANSIT_DISTANCE(6,6)=0;
TRANSIT_DISTANCE(6,7)=437.5;
TRANSIT_DISTANCE(6,8)=875;
TRANSIT_DISTANCE(6,9)=2964;
TRANSIT_DISTANCE(6,10)=2657.5;
TRANSIT_DISTANCE(6,11)=2392.2;
TRANSIT_DISTANCE(6,12)=2183;
TRANSIT_DISTANCE(6,13)=2047.3;
TRANSIT_DISTANCE(6,14)=2000;
TRANSIT_DISTANCE(6,15)=2047.3;
TRANSIT_DISTANCE(6,16)=2183;

TRANSIT_DISTANCE(7,1)=2625;
TRANSIT_DISTANCE(7,2)=2187.5;
TRANSIT_DISTANCE(7,3)=1750;
TRANSIT_DISTANCE(7,4)=1312.5;
TRANSIT_DISTANCE(7,5)=875;
TRANSIT_DISTANCE(7,6)=437.5;
TRANSIT_DISTANCE(7,7)=0;
TRANSIT_DISTANCE(7,8)=437.5;
TRANSIT_DISTANCE(7,9)=3300.1;
TRANSIT_DISTANCE(7,10)=2964;
TRANSIT_DISTANCE(7,11)=2657.5;
TRANSIT_DISTANCE(7,12)=2392.2;
TRANSIT_DISTANCE(7,13)=2183;
TRANSIT_DISTANCE(7,14)=2047.3;
TRANSIT_DISTANCE(7,15)=2000;
TRANSIT_DISTANCE(7,16)=2047.3;

TRANSIT_DISTANCE(8,1)=3062.5;
TRANSIT_DISTANCE(8,2)=2625;
TRANSIT_DISTANCE(8,3)=2187.5;
TRANSIT_DISTANCE(8,4)=1750;
TRANSIT_DISTANCE(8,5)=1312.5;
TRANSIT_DISTANCE(8,6)=875;
TRANSIT_DISTANCE(8,7)=437.5;
TRANSIT_DISTANCE(8,8)=0;
TRANSIT_DISTANCE(8,9)=3657.7;
TRANSIT_DISTANCE(8,10)=3300.1;
TRANSIT_DISTANCE(8,11)=2964;
TRANSIT_DISTANCE(8,12)=2657.5;
TRANSIT_DISTANCE(8,13)=2392.2;
TRANSIT_DISTANCE(8,14)=2183;
TRANSIT_DISTANCE(8,15)=2047.3;

```
TRANSIT_DISTANCE(8,16)=2000;

TRANSIT_DISTANCE(9,1)=2000;
TRANSIT_DISTANCE(9,2)=2047.3;
TRANSIT_DISTANCE(9,3)=2183;
TRANSIT_DISTANCE(9,4)=2392.2;
TRANSIT_DISTANCE(9,5)=2657.5;
TRANSIT_DISTANCE(9,6)=2964;
TRANSIT_DISTANCE(9,7)=3300.1;
TRANSIT_DISTANCE(9,8)=3657.7;
TRANSIT_DISTANCE(9,9)=0;
TRANSIT_DISTANCE(9,10)=437.5;
TRANSIT_DISTANCE(9,11)=872;
TRANSIT_DISTANCE(9,12)=1312.5;
TRANSIT_DISTANCE(9,13)=1750;
TRANSIT_DISTANCE(9,14)=2187.5;
TRANSIT_DISTANCE(9,15)=2625;
TRANSIT_DISTANCE(9,16)=3062.5;

TRANSIT_DISTANCE(10,1)=2047.3;
TRANSIT_DISTANCE(10,2)=2000;
TRANSIT_DISTANCE(10,3)=2047.3;
TRANSIT_DISTANCE(10,4)=2183;
TRANSIT_DISTANCE(10,5)=2392.2;
TRANSIT_DISTANCE(10,6)=2657.5;
TRANSIT_DISTANCE(10,7)=2964;
TRANSIT_DISTANCE(10,8)=3300.1;
TRANSIT_DISTANCE(10,9)=437.5;
TRANSIT_DISTANCE(10,10)=0;
TRANSIT_DISTANCE(10,11)=437.5;
TRANSIT_DISTANCE(10,12)=875;
TRANSIT_DISTANCE(10,13)=1312.5;
TRANSIT_DISTANCE(10,14)=1750;
TRANSIT_DISTANCE(10,15)=2187.5;
TRANSIT_DISTANCE(10,16)=2625;

TRANSIT_DISTANCE(11,1)=2183;
TRANSIT_DISTANCE(11,2)=2047.;
TRANSIT_DISTANCE(11,3)=2000;
TRANSIT_DISTANCE(11,4)=2047.3;
TRANSIT_DISTANCE(11,5)=2183;
TRANSIT_DISTANCE(11,6)=2392.2;
TRANSIT_DISTANCE(11,7)=2657.5;
TRANSIT_DISTANCE(11,8)=2964;
TRANSIT_DISTANCE(11,9)=875;
TRANSIT_DISTANCE(11,10)=437.5;
TRANSIT_DISTANCE(11,11)=0;
TRANSIT_DISTANCE(11,12)=437.5;
TRANSIT_DISTANCE(11,13)=875;
```

TRANSIT_DISTANCE(11,14)=1312.5;
TRANSIT_DISTANCE(11,15)=1750;
TRANSIT_DISTANCE(11,16)=2187.5;

TRANSIT_DISTANCE(12,1)=2392.2;
TRANSIT_DISTANCE(12,2)=2183;
TRANSIT_DISTANCE(12,3)=2047.3;
TRANSIT_DISTANCE(12,4)=2000;
TRANSIT_DISTANCE(12,5)=2047.3;
TRANSIT_DISTANCE(12,6)=2183;
TRANSIT_DISTANCE(12,7)=2392.2;
TRANSIT_DISTANCE(12,8)=2657.5;
TRANSIT_DISTANCE(12,9)=1312.5;
TRANSIT_DISTANCE(12,10)=875;
TRANSIT_DISTANCE(12,11)=437.5;
TRANSIT_DISTANCE(12,12)=0;
TRANSIT_DISTANCE(12,13)=437.5;
TRANSIT_DISTANCE(12,14)=875;
TRANSIT_DISTANCE(12,15)=1312.5;
TRANSIT_DISTANCE(12,16)=1750;

TRANSIT_DISTANCE(13,1)=2657.5;
TRANSIT_DISTANCE(13,2)=2392.2;
TRANSIT_DISTANCE(13,3)=2183;
TRANSIT_DISTANCE(13,4)=2047.3;
TRANSIT_DISTANCE(13,5)=2000;
TRANSIT_DISTANCE(13,6)=2047.3;
TRANSIT_DISTANCE(13,7)=2183;
TRANSIT_DISTANCE(13,8)=2392.2;
TRANSIT_DISTANCE(13,9)=1750;
TRANSIT_DISTANCE(13,10)=1312.5;
TRANSIT_DISTANCE(13,11)=875;
TRANSIT_DISTANCE(13,12)=437.5;
TRANSIT_DISTANCE(13,13)=0;
TRANSIT_DISTANCE(13,14)=437.5;
TRANSIT_DISTANCE(13,15)=875;
TRANSIT_DISTANCE(13,16)=1312.5;

TRANSIT_DISTANCE(14,1)=2964;
TRANSIT_DISTANCE(14,2)=2657.5;
TRANSIT_DISTANCE(14,3)=2392.2;
TRANSIT_DISTANCE(14,4)=2183;
TRANSIT_DISTANCE(14,5)=2047.3;
TRANSIT_DISTANCE(14,6)=2000;
TRANSIT_DISTANCE(14,7)=2047.3;
TRANSIT_DISTANCE(14,8)=2183;
TRANSIT_DISTANCE(14,9)=2187.5;
TRANSIT_DISTANCE(14,10)=1750;
TRANSIT_DISTANCE(14,11)=1312.5;

```
TRANSIT_DISTANCE(14,12)=875;
TRANSIT_DISTANCE(14,13)=437.5;
TRANSIT_DISTANCE(14,14)=0;
TRANSIT_DISTANCE(14,15)=437.5;
TRANSIT_DISTANCE(14,16)=875;

TRANSIT_DISTANCE(15,1)=3300.1;
TRANSIT_DISTANCE(15,2)=2964;
TRANSIT_DISTANCE(15,3)=2657.5;
TRANSIT_DISTANCE(15,4)=2392.2;
TRANSIT_DISTANCE(15,5)=2183;
TRANSIT_DISTANCE(15,6)=2047.3;
TRANSIT_DISTANCE(15,7)=2000;
TRANSIT_DISTANCE(15,8)=2047.3;
TRANSIT_DISTANCE(15,9)=2625;
TRANSIT_DISTANCE(15,10)=2187.5;
TRANSIT_DISTANCE(15,11)=1750;
TRANSIT_DISTANCE(15,12)=1312.5;
TRANSIT_DISTANCE(15,13)=875;
TRANSIT_DISTANCE(15,14)=437.5;
TRANSIT_DISTANCE(15,15)=0;
TRANSIT_DISTANCE(15,16)=437.5;

TRANSIT_DISTANCE(16,1)=3657.7;
TRANSIT_DISTANCE(16,2)=3300.1;
TRANSIT_DISTANCE(16,3)=2964;
TRANSIT_DISTANCE(16,4)=2657.5;
TRANSIT_DISTANCE(16,5)=2392.2;
TRANSIT_DISTANCE(16,6)=2183;
TRANSIT_DISTANCE(16,7)=2047.3;
TRANSIT_DISTANCE(16,8)=2000;
TRANSIT_DISTANCE(16,9)=3062.5;
TRANSIT_DISTANCE(16,10)=2625;
TRANSIT_DISTANCE(16,11)=2187.5;
TRANSIT_DISTANCE(16,12)=1750;
TRANSIT_DISTANCE(16,13)=1312.5;
TRANSIT_DISTANCE(16,14)=875;
TRANSIT_DISTANCE(16,15)=437.5;
TRANSIT_DISTANCE(16,16)=0;


%--------arrive time, depart time, no of passenger for each flight---------

%----------------timewindow1(PEN)F0300--------------------

AT_TW1=7;       %arrivetime_timewindow1
DT_TW1=11;      %departtime_timewindow1
PE_TW1=160;     %
PKBK_TW1=20;
```

```
PKCH_TW1=20;

%----------------timewindow2(PEN)F0200--------------------

AT_TW2=9;
DT_TW2=13;
PE_TW2=160;
PKBK_TW2=20;
PKCH_TW2=20;

%----------------timewindow3(PEN)F0100--------------------

AT_TW3=12;
DT_TW3=15;
PE_TW3=160;%PE_TW
PKBK_TW3=20;%PKBK_TW
PKCH_TW3=20;%PKCH_TW

%----------------timewindow4(PEN)F0400--------------------

AT_TW4=14;
DT_TW4=16;
PE_TW4=100;
PKBK_TW4=50;
PKCH_TW4=50;

%----------------timewindow5(PEN)F0301--------------------

AT_TW5=15;
DT_TW5=18;
PE_TW5=70;
PKBK_TW5=60;
PKCH_TW5=50;

%----------------timewindow6(PEN)F0401--------------------

AT_TW6=18;
DT_TW6=20;
PE_TW6=60;
PKBK_TW6=50;
PKCH_TW6=40;

%----------------timewindow7(PEN)F0101--------------------

AT_TW7=19;
DT_TW7=22;
PE_TW7=70;
PKBK_TW7=50;
PKCH_TW7=30;
```

```
%----------------timewindow8(PEN)F0201--------------------

AT_TW8=20;
DT_TW8=23;
PE_TW8=50;
PKBK_TW8=50;
PKCH_TW8=50;

%----------------timewindow9 (PEN-last flight)F0402--------------------

AT_TW9=21;
DT_TW9=25;
PE_TW9=100;

%----------------timewindow10 (PEN-last flight)F0102--------------------

AT_TW10=24;
DT_TW10=25;
PE_TW10=100;

%----------------timewindow11 (BKI)F0800--------------------

AT_TW11=9;
DT_TW11=13;
PE_TW11=120;
PPEN_TW11=50;
PKCH_TW11=30;

%----------------timewindow12 (BKI)F0700--------------------

AT_TW12=12;
DT_TW12=16;
PE_TW12=120;
PPEN_TW12=50;
PKCH_TW12=30;

%----------------timewindoW13 (BKI) F0600--------------------

AT_TW13=13;
DT_TW13=17;
PE_TW13=100;
PPEN_TW13=50;
PKCH_TW13=50;

%----------------timewindoW14 (BKI) F0500--------------------

AT_TW14=14;
DT_TW14=18;
```

```
PE_TW14=80;
PPEN_TW14=60;
PKCH_TW14=60;

%----------------timewindow15 (BKI) F0900--------------------

AT_TW15=18;
DT_TW15=19;
PE_TW15=20;
PPEN_TW15=60;
PKCH_TW15=70;

%----------------timewindow16 (BKI) F0801--------------------
AT_TW16=20;
DT_TW16=22;
PE_TW16=50;
PPEN_TW16=50;
PKCH_TW16=50;

%----------------timewindow17 (last flight)F0701--------------------
AT_TW17=21;
DT_TW17=25;
PE_TW17=150;

%----------------timewindow18 (last flight)F0601--------------------

AT_TW18=21;
DT_TW18=25;
PE_TW18=100;

%----------------timewindow19 (last flight)F0501--------------------

AT_TW19=22;
DT_TW19=25;
PE_TW19=100;

%----------------timewindow20 (last flight)F0901--------------------

AT_TW20=23;
DT_TW20=25;
PE_TW20=100;

%----------------timewindow21 (KCH)F1000--------------------

AT_TW21=8;
DT_TW21=16;
PE_TW21=130;
PPEN_TW21=50;
PKBK_TW21=20;
```

```
%----------------timewindow22 (KCH)F1100--------------------

AT_TW22=10;
DT_TW22=17;
PE_TW22=130;
PPEN_TW22=50;
PKBK_TW22=20;

%----------------timewindow23  (KCH) F1200--------------------

AT_TW23=12;
DT_TW23=18;
PE_TW23=130;
PPEN_TW23=50;
PKBK_TW23=20;

%----------------timewindow24 (F1300)--------------------

AT_TW24=13;
DT_TW24=19;
PE_TW24=50;
PPEN_TW24=100;
PKBK_TW24=50;

%----------------timewindow25 (F1001)--------------------

AT_TW25=16;
DT_TW25=20;
PE_TW25=50;
PPEN_TW25=50;
PKBK_TW25=50;

%----------------timewindow26 (F1101)--------------------

AT_TW26=17;
DT_TW26=20;
PE_TW26=30;
PPEN_TW26=90;
PKBK_TW26=80;

%----------------timewindow27 (F1201)--------------------

AT_TW27=19;
DT_TW27=23;
PE_TW27=50;
PPEN_TW27=50;
PKBK_TW27=50;
```

```
%----------------timewindow28(LAST FLIGHT) F1301--------------------

AT_TW28=20;
DT_TW28=25;
PE_TW28=100;

%----------------timewindow29 (LAST FLIGHT)F1400--------------------

AT_TW29=20;
DT_TW29=25;
PE_TW29=100;

%----------------timewindow30 (LAST FLIGHT)F1102--------------------

AT_TW30=20;
DT_TW30=25;
PE_TW30=100;

%----------------timewindow31 (LAST FLIGHT)F1202--------------------

AT_TW31=24;
DT_TW31=25;
PE_TW31=50;


%-------------------------already assigned gate--------------------------

%----------------timewindow32 (first flight)--------------------

AT_TW32=6;
DT_TW32=8;
PE_TW32=100;

validity_table(32,AT_TW32:DT_TW32)=4;
A=(GATE_DISTANCE3*PE_TW32);

%----------------timewindow33 (first flight)--------------------

AT_TW33=6;
DT_TW33=9;
PE_TW33=100;

validity_table(33,AT_TW33:DT_TW33)=5;
B=(GATE_DISTANCE4*PE_TW33);

%----------------timewindow34--------------------

AT_TW34=6;
DT_TW34=7;
```

```
PE_TW34=200;

validity_table(34,AT_TW34:DT_TW34)=11;
C=(GATE_DISTANCE10*PE_TW34);

%----------------timewindow35--------------------

AT_TW35=6;
DT_TW35=8;
PE_TW35=200;

validity_table(35,AT_TW35:DT_TW35)=8;
D=(GATE_DISTANCE7*PE_TW35);

%----------------timewindow36--------------------

AT_TW36=6;
DT_TW36=10;
PE_TW36=150;

validity_table(36,AT_TW36:DT_TW36)=9;
E=(GATE_DISTANCE8*PE_TW36);

%----------------timewindow37--------------------

AT_TW37=6;
DT_TW37=11;
PE_TW37=150;

validity_table(37,AT_TW37:DT_TW37)=13;
F=(GATE_DISTANCE12*PE_TW37);

%----------------timewindow38--------------------

AT_TW38=6;
DT_TW38=8;
PE_TW38=100;

validity_table(38,AT_TW38:DT_TW38)=2;
G=(GATE_DISTANCE1*PE_TW38);

%----------------timewindow39--------------------

AT_TW39=6;
DT_TW39=10;
PE_TW39=100;

validity_table(39,AT_TW39:DT_TW39)=3;
H=(GATE_DISTANCE2*PE_TW39);
```

```
%----------------timewindow40--------------------

AT_TW40=6;
DT_TW40=11;
PE_TW40=100;

validity_table(40,AT_TW40:DT_TW40)=16;
I=(GATE_DISTANCE15*PE_TW40);

%----------------timewindow41--------------------

AT_TW41=6;
DT_TW41=12;
PE_TW41=100;

validity_table(41,AT_TW41:DT_TW41)=6;
J=(GATE_DISTANCE5*PE_TW41);

%----------------total first flight--------------------

TOTAL_DISTANCE_FIRST_FLIGHT=(A+B+C+D+E+F+G+H+I+J);
```

- Check_validity.m

```
power=100000;

for kk=6:24

   uu=unique(validity_table(:,kk));
   uu(uu(:,1)==0,:)=[];
   nn=histc(validity_table(:,kk),uu);
   nn(nn(:,1)==1,:)=[];

   if isempty(nn)

      validity_table(41,kk)=0;

   else

      validity_table(41,kk)=sum(nn);

   end

end

sum_value(ii,1)=sum(validity_table(41,6:24));

if sum_value(ii,1)==0
```

```
    fit(ii,1)=TOTAL_DISTANCE;
    validity(ii,1)=0;

elseif sum_value(ii,1)==1

    fit(ii,1)=TOTAL_DISTANCE+(power^1);
    validity(ii,1)=1;

elseif sum_value(ii,1)==2

    fit(ii,1)=TOTAL_DISTANCE+(power^2);
    validity(ii,1)=2;

elseif sum_value(ii,1)==3

    fit(ii,1)=TOTAL_DISTANCE+(power^3);
    validity(ii,1)=3;

elseif sum_value(ii,1)==4

    fit(ii,1)=TOTAL_DISTANCE+(power^4);
    validity(ii,1)=4;

elseif sum_value(ii,1)==5

    fit(ii,1)=TOTAL_DISTANCE+(power^5);
    validity(ii,1)=5;

elseif sum_value(ii,1)==6

    fit(ii,1)=TOTAL_DISTANCE+(power^6);
    validity(ii,1)=6;

elseif sum_value(ii,1)==7

    fit(ii,1)=TOTAL_DISTANCE+(power^7);
    validity(ii,1)=7;

elseif sum_value(ii,1)==8

    fit(ii,1)=TOTAL_DISTANCE+(power^8);
    validity(ii,1)=8;


elseif sum_value(ii,1)==9

    fit(ii,1)=TOTAL_DISTANCE+(power^9);
    validity(ii,1)=9;
```

```
elseif sum_value(ii,1)==10

   fit(ii,1)=TOTAL_DISTANCE+(power^10);
   validity(ii,1)=10;

elseif sum_value(ii,1)==11

   fit(ii,1)=TOTAL_DISTANCE+(power^11);
   validity(ii,1)=11;

elseif sum_value(ii,1)==12

   fit(ii,1)=TOTAL_DISTANCE+(power^12);
   validity(ii,1)=12;

elseif sum_value(ii,1)==13

   fit(ii,1)=TOTAL_DISTANCE+(power^13);
   validity(ii,1)=13;

elseif sum_value(ii,1)==14

   fit(ii,1)=TOTAL_DISTANCE+(power^14);
   validity(ii,1)=14;

elseif sum_value(ii,1)==15

   fit(ii,1)=TOTAL_DISTANCE+(power^15);
   validity(ii,1)=15;

elseif sum_value(ii,1)==16

   fit(ii,1)=TOTAL_DISTANCE+(power^16);
   validity(ii,1)=16;

elseif sum_value(ii,1)==17

   fit(ii,1)=TOTAL_DISTANCE+(power^17);
   validity(ii,1)=17;

elseif sum_value(ii,1)==18

   fit(ii,1)=TOTAL_DISTANCE+(power^18);
   validity(ii,1)=18;

elseif sum_value(ii,1)==19

   fit(ii,1)=TOTAL_DISTANCE+(power^19);
   validity(ii,1)=19;
```

```
elseif sum_value(ii,1)==20

    fit(ii,1)=TOTAL_DISTANCE+(power^20);
    validity(ii,1)=20;

elseif sum_value(ii,1)==21

    fit(ii,1)=TOTAL_DISTANCE+(power^21);
    validity(ii,1)=21;

elseif sum_value(ii,1)==22

    fit(ii,1)=TOTAL_DISTANCE+(power^22);
    validity(ii,1)=22;

elseif sum_value(ii,1)==23

    fit(ii,1)=TOTAL_DISTANCE+(power^23);
    validity(ii,1)=23;

elseif sum_value(ii,1)==24

    fit(ii,1)=TOTAL_DISTANCE+(power^24);
    validity(ii,1)=24;


elseif sum_value(ii,1)==25

    fit(ii,1)=TOTAL_DISTANCE+(power^25);
    validity(ii,1)=25;

elseif sum_value(ii,1)==26

    fit(ii,1)=TOTAL_DISTANCE+(power^26);
    validity(ii,1)=26;

elseif sum_value(ii,1)==27

    fit(ii,1)=TOTAL_DISTANCE+(power^27);
    validity(ii,1)=27;

elseif sum_value(ii,1)==28

    fit(ii,1)=TOTAL_DISTANCE+(power^28);
    validity(ii,1)=28;

elseif sum_value(ii,1)==29
```

```
    fit(ii,1)=TOTAL_DISTANCE+(power^29);
    validity(ii,1)=29;

elseif sum_value(ii,1)==30

    fit(ii,1)=TOTAL_DISTANCE+(power^30);
    validity(ii,1)=30;

elseif sum_value(ii,1)==31

    fit(ii,1)=TOTAL_DISTANCE+(power^31);
    validity(ii,1)=31;

elseif sum_value(ii,1)==32

    fit(ii,1)=TOTAL_DISTANCE+(power^32);
    validity(ii,1)=32;

elseif sum_value(ii,1)==33

    fit(ii,1)=TOTAL_DISTANCE+(power^33);
    validity(ii,1)=33;

elseif sum_value(ii,1)==34

    fit(ii,1)=TOTAL_DISTANCE+(power^34);
    validity(ii,1)=34;


elseif sum_value(ii,1)==35

    fit(ii,1)=TOTAL_DISTANCE+(power^35);
    validity(ii,1)=35;

elseif sum_value(ii,1)==36

    fit(ii,1)=TOTAL_DISTANCE+(power^36);
    validity(ii,1)=36;

elseif sum_value(ii,1)==37

    fit(ii,1)=TOTAL_DISTANCE+(power^37);
    validity(ii,1)=37;

elseif sum_value(ii,1)==38

    fit(ii,1)=TOTAL_DISTANCE+(power^38);
    validity(ii,1)=38;
```

```
elseif sum_value(ii,1)==39

    fit(ii,1)=TOTAL_DISTANCE+(power^39);
    validity(ii,1)=39;


elseif sum_value(ii,1)==40

    fit(ii,1)=TOTAL_DISTANCE+(power^40);
    validity(ii,1)=40;

elseif sum_value(ii,1)==41

    fit(ii,1)=TOTAL_DISTANCE+(power^41);
    validity(ii,1)=41;

elseif sum_value(ii,1)==42

    fit(ii,1)=TOTAL_DISTANCE+(power^42);
    validity(ii,1)=42;

elseif sum_value(ii,1)==43

    fit(ii,1)=TOTAL_DISTANCE+(power^43);
    validity(ii,1)=43;

elseif sum_value(ii,1)==44

    fit(ii,1)=TOTAL_DISTANCE+(power^44);
    validity(ii,1)=44;

elseif sum_value(ii,1)==45

    fit(ii,1)=TOTAL_DISTANCE+(power^45);
    validity(ii,1)=45;

elseif sum_value(ii,1)==46

    fit(ii,1)=TOTAL_DISTANCE+(power^46);
    validity(ii,1)=46;

elseif sum_value(ii,1)==47

    fit(ii,1)=TOTAL_DISTANCE+(power^47);
    validity(ii,1)=47;

elseif sum_value(ii,1)==48

    fit(ii,1)=TOTAL_DISTANCE+(power^48);
```

```
    validity(ii,1)=48;

elseif sum_value(ii,1)==49

    fit(ii,1)=TOTAL_DISTANCE+(power^49);
    validity(ii,1)=49;

elseif sum_value(ii,1)==50

    fit(ii,1)=TOTAL_DISTANCE+(power^50);
    validity(ii,1)=50;

elseif sum_value(ii,1)==51

    fit(ii,1)=TOTAL_DISTANCE+(power^51);
    validity(ii,1)=51;

elseif sum_value(ii,1)==52

    fit(ii,1)=TOTAL_DISTANCE+(power^52);
    validity(ii,1)=52;

elseif sum_value(ii,1)==53

    fit(ii,1)=TOTAL_DISTANCE+(power^53);
    validity(ii,1)=53;

elseif sum_value(ii,1)==54

    fit(ii,1)=TOTAL_DISTANCE+(power^54);
    validity(ii,1)=54;


elseif sum_value(ii,1)==55

    fit(ii,1)=TOTAL_DISTANCE+(power^55);
    validity(ii,1)=55;

elseif sum_value(ii,1)==56

    fit(ii,1)=TOTAL_DISTANCE+(power^56);
    validity(ii,1)=56;

elseif sum_value(ii,1)==57

    fit(ii,1)=TOTAL_DISTANCE+(power^57);
    validity(ii,1)=57;

elseif sum_value(ii,1)==58
```

```
    fit(ii,1)=TOTAL_DISTANCE+(power^58);
    validity(ii,1)=58;

elseif sum_value(ii,1)==59

    fit(ii,1)=TOTAL_DISTANCE+(power^59);
    validity(ii,1)=59;


elseif sum_value(ii,1)==60

    fit(ii,1)=TOTAL_DISTANCE+(power^60);
    validity(ii,1)=60;

elseif sum_value(ii,1)==61

    fit(ii,1)=TOTAL_DISTANCE+(power^61);
    validity(ii,1)=61;

elseif sum_value(ii,1)==62

    fit(ii,1)=TOTAL_DISTANCE+(power^62);
    validity(ii,1)=62;

elseif sum_value(ii,1)==63

    fit(ii,1)=TOTAL_DISTANCE+(power^63);
    validity(ii,1)=63;

elseif sum_value(ii,1)==64

    fit(ii,1)=TOTAL_DISTANCE+(power^64);
    validity(ii,1)=64;

elseif sum_value(ii,1)==65

    fit(ii,1)=TOTAL_DISTANCE+(power^65);
    validity(ii,1)=65;

elseif sum_value(ii,1)==66

    fit(ii,1)=TOTAL_DISTANCE+(power^66);
    validity(ii,1)=66;

elseif sum_value(ii,1)==67

    fit(ii,1)=TOTAL_DISTANCE+(power^67);
    validity(ii,1)=67;
```

```
elseif sum_value(ii,1)==68

   fit(ii,1)=TOTAL_DISTANCE+(power^68);
   validity(ii,1)=68;

elseif sum_value(ii,1)==69

   fit(ii,1)=TOTAL_DISTANCE+(power^69);
   validity(ii,1)=69;

elseif sum_value(ii,1)==70

   fit(ii,1)=TOTAL_DISTANCE+(power^70);
   validity(ii,1)=70;

elseif sum_value(ii,1)==71

   fit(ii,1)=TOTAL_DISTANCE+(power^71);
   validity(ii,1)=71;

elseif sum_value(ii,1)==72

   fit(ii,1)=TOTAL_DISTANCE+(power^72);
   validity(ii,1)=72;

elseif sum_value(ii,1)==73

   fit(ii,1)=TOTAL_DISTANCE+(power^73);
   validity(ii,1)=73;

elseif sum_value(ii,1)==74

   fit(ii,1)=TOTAL_DISTANCE+(power^74);
   validity(ii,1)=74;


elseif sum_value(ii,1)==75

   fit(ii,1)=TOTAL_DISTANCE+(power^75);
   validity(ii,1)=75;

elseif sum_value(ii,1)==76

   fit(ii,1)=TOTAL_DISTANCE+(power^76);
   validity(ii,1)=76;

elseif sum_value(ii,1)==77
```

```
    fit(ii,1)=TOTAL_DISTANCE+(power^77);
    validity(ii,1)=77;

elseif sum_value(ii,1)==78

    fit(ii,1)=TOTAL_DISTANCE+(power^78);
    validity(ii,1)=78;

elseif sum_value(ii,1)==79

    fit(ii,1)=TOTAL_DISTANCE+(power^79);
    validity(ii,1)=79;


elseif sum_value(ii,1)==80

    fit(ii,1)=TOTAL_DISTANCE+(power^80);
    validity(ii,1)=80;

elseif sum_value(ii,1)==81

    fit(ii,1)=TOTAL_DISTANCE+(power^81);
    validity(ii,1)=81;

elseif sum_value(ii,1)==82

    fit(ii,1)=TOTAL_DISTANCE+(power^82);
    validity(ii,1)=82;

elseif sum_value(ii,1)==83

    fit(ii,1)=TOTAL_DISTANCE+(power^83);
    validity(ii,1)=83;

elseif sum_value(ii,1)==84

    fit(ii,1)=TOTAL_DISTANCE+(power^84);
    validity(ii,1)=84;

elseif sum_value(ii,1)==85

    fit(ii,1)=TOTAL_DISTANCE+(power^85);
    validity(ii,1)=85;

elseif sum_value(ii,1)==86

    fit(ii,1)=TOTAL_DISTANCE+(power^86);
    validity(ii,1)=86;
```

```
elseif sum_value(ii,1)==87

   fit(ii,1)=TOTAL_DISTANCE+(power^87);
   validity(ii,1)=87;

elseif sum_value(ii,1)==88

   fit(ii,1)=TOTAL_DISTANCE+(power^88);
   validity(ii,1)=88;

elseif sum_value(ii,1)==89

   fit(ii,1)=TOTAL_DISTANCE+(power^89);
   validity(ii,1)=89;

elseif sum_value(ii,1)==90

   fit(ii,1)=TOTAL_DISTANCE+(power^90);
   validity(ii,1)=90;

elseif sum_value(ii,1)==91

   fit(ii,1)=TOTAL_DISTANCE+(power^91);
   validity(ii,1)=91;

elseif sum_value(ii,1)==92

   fit(ii,1)=TOTAL_DISTANCE+(power^92);
   validity(ii,1)=92;

elseif sum_value(ii,1)==93

   fit(ii,1)=TOTAL_DISTANCE+(power^93);
   validity(ii,1)=93;

elseif sum_value(ii,1)==94

   fit(ii,1)=TOTAL_DISTANCE+(power^94);
   validity(ii,1)=94;


elseif sum_value(ii,1)==95

   fit(ii,1)=TOTAL_DISTANCE+(power^95);
   validity(ii,1)=95;

elseif sum_value(ii,1)==96

   fit(ii,1)=TOTAL_DISTANCE+(power^96);
```

```
    validity(ii,1)=96;

elseif sum_value(ii,1)==97

    fit(ii,1)=TOTAL_DISTANCE+(power^97);
    validity(ii,1)=97;

elseif sum_value(ii,1)==98

    fit(ii,1)=TOTAL_DISTANCE+(power^98);
    validity(ii,1)=98;

elseif sum_value(ii,1)==99

    fit(ii,1)=TOTAL_DISTANCE+(power^99);
    validity(ii,1)=99;


elseif sum_value(ii,1)==100

    fit(ii,1)=TOTAL_DISTANCE+(power^100);
    validity(ii,1)=100;


elseif sum_value(ii,1)>100

    fit(ii,1)=TOTAL_DISTANCE+(power^101);
    validity(ii,1)=101;

end
```

- Convert_decimal.m

```
%----------------timewindow1--------------------

if S(1,1)==0 && S(1,2)==0 && S(1,3)==0 && S(1,4)==0

    x_decimal(1,1)=0;

elseif S(1,1)==0 && S(1,2)==0 && S(1,3)==0 && S(1,4)==1

    x_decimal(1,1)=1;

elseif S(1,1)==0 && S(1,2)==0 && S(1,3)==1 && S(1,4)==0

    x_decimal(1,1)=2;

elseif S(1,1)==0 && S(1,2)==0 && S(1,3)==1 && S(1,4)==1
```

```
    x_decimal(1,1)=3;
elseif S(1,1)==0 && S(1,2)==1 && S(1,3)==0 && S(1,4)==0
    x_decimal(1,1)=4;
elseif S(1,1)==0 && S(1,2)==1 && S(1,3)==0 && S(1,4)==1
    x_decimal(1,1)=5;
elseif S(1,1)==0 && S(1,2)==1 && S(1,3)==1 && S(1,4)==0
    x_decimal(1,1)=6;
elseif S(1,1)==0 && S(1,2)==1 && S(1,3)==1 && S(1,4)==1
    x_decimal(1,1)=7;
elseif S(1,1)==1 && S(1,2)==0 && S(1,3)==0 && S(1,4)==0
    x_decimal(1,1)=8;
elseif S(1,1)==1 && S(1,2)==0 && S(1,3)==0 && S(1,4)==1
    x_decimal(1,1)=9;
elseif S(1,1)==1 && S(1,2)==0 && S(1,3)==1 && S(1,4)==0
    x_decimal(1,1)=10;
elseif S(1,1)==1 && S(1,2)==0 && S(1,3)==1 && S(1,4)==1
    x_decimal(1,1)=11;
elseif S(1,1)==1 && S(1,2)==1 && S(1,3)==0 && S(1,4)==0
    x_decimal(1,1)=12;
elseif S(1,1)==1 && S(1,2)==1 && S(1,3)==0 && S(1,4)==1
    x_decimal(1,1)=13;
elseif S(1,1)==1 && S(1,2)==1 && S(1,3)==1 && S(1,4)==0
    x_decimal(1,1)=14;
elseif S(1,1)==1 && S(1,2)==1 && S(1,3)==1 && S(1,4)==1
    x_decimal(1,1)=15;
```

```
end
%----------------timewindow2--------------------
if S(1,5)==0 && S(1,6)==0 && S(1,7)==0 && S(1,8)==0
   x_decimal(1,2)=0;
elseif S(1,5)==0 && S(1,6)==0 && S(1,7)==0 && S(1,8)==1
   x_decimal(1,2)=1;
elseif S(1,5)==0 && S(1,6)==0 && S(1,7)==1 && S(1,8)==0
   x_decimal(1,2)=2;

elseif S(1,5)==0 && S(1,6)==0 && S(1,7)==1 && S(1,8)==1
   x_decimal(1,2)=3;
elseif S(1,5)==0 && S(1,6)==1 && S(1,7)==0 && S(1,8)==0
   x_decimal(1,2)=4;
elseif S(1,5)==0 && S(1,6)==1 && S(1,7)==0 && S(1,8)==1
   x_decimal(1,2)=5;
elseif S(1,5)==0 && S(1,6)==1 && S(1,7)==1 && S(1,8)==0
   x_decimal(1,2)=6;
elseif S(1,5)==0 && S(1,6)==1 && S(1,7)==1 && S(1,8)==1
   x_decimal(1,2)=7;
elseif S(1,5)==1 && S(1,6)==0 && S(1,7)==0 && S(1,8)==0
   x_decimal(1,2)=8;
elseif S(1,5)==1 && S(1,6)==0 && S(1,7)==0 && S(1,8)==1
   x_decimal(1,2)=9;
elseif S(1,5)==1 && S(1,6)==0 && S(1,7)==1 && S(1,8)==0
   x_decimal(1,2)=10;
```

```
elseif S(1,5)==1 && S(1,6)==0 && S(1,7)==1 && S(1,8)==1
   x_decimal(1,2)=11;

elseif S(1,5)==1 && S(1,6)==1 && S(1,7)==0 && S(1,8)==0
   x_decimal(1,2)=12;
elseif S(1,5)==1 && S(1,6)==1 && S(1,7)==0 && S(1,8)==1
   x_decimal(1,2)=13;
elseif S(1,5)==1 && S(1,6)==1 && S(1,7)==1 && S(1,8)==0
   x_decimal(1,2)=14;

elseif S(1,5)==1 && S(1,6)==1 && S(1,7)==1 && S(1,8)==1
   x_decimal(1,2)=15;

end

%----------------timewindow3-------------------
if S(1,9)==0 && S(1,10)==0 && S(1,11)==0 && S(1,12)==0
   x_decimal(1,3)=0;
elseif S(1,9)==0 && S(1,10)==0 && S(1,11)==0 && S(1,12)==1
   x_decimal(1,3)=1;
elseif S(1,9)==0 && S(1,10)==0 && S(1,11)==1 && S(1,12)==0
   x_decimal(1,3)=2;

elseif S(1,9)==0 && S(1,10)==0 && S(1,11)==1 && S(1,12)==1
   x_decimal(1,3)=3;
elseif S(1,9)==0 && S(1,10)==1 && S(1,11)==0 && S(1,12)==0
```

```
    x_decimal(1,3)=4;

elseif S(1,9)==0 && S(1,10)==1 && S(1,11)==0 && S(1,12)==1
    x_decimal(1,3)=5;

elseif S(1,9)==0 && S(1,10)==1 && S(1,11)==1 && S(1,12)==0
    x_decimal(1,3)=6;

elseif S(1,9)==0 && S(1,10)==1 && S(1,11)==1 && S(1,12)==1
    x_decimal(1,3)=7;
elseif S(1,9)==1 && S(1,10)==0 && S(1,11)==0 && S(1,12)==0
    x_decimal(1,3)=8;
elseif S(1,9)==1 && S(1,10)==0 && S(1,11)==0 && S(1,12)==1
    x_decimal(1,3)=9;
elseif S(1,9)==1 && S(1,10)==0 && S(1,11)==1 && S(1,12)==0
    x_decimal(1,3)=10;
elseif S(1,9)==1 && S(1,10)==0 && S(1,11)==1 && S(1,12)==1
    x_decimal(1,3)=11;
elseif S(1,9)==1 && S(1,10)==1 && S(1,11)==0 && S(1,12)==0
    x_decimal(1,3)=12;
elseif S(1,9)==1 && S(1,10)==1 && S(1,11)==0 && S(1,12)==1
    x_decimal(1,3)=13;
elseif S(1,9)==1 && S(1,10)==1 && S(1,11)==1 && S(1,12)==0
    x_decimal(1,3)=14;
elseif S(1,9)==1 && S(1,10)==1 && S(1,11)==1 && S(1,12)==1
    x_decimal(1,3)=15;
```

```
end

%----------------timewindow4--------------------

if S(1,13)==0 && S(1,14)==0 && S(1,15)==0 && S(1,16)==0
   x_decimal(1,4)=0;
elseif S(1,13)==0 && S(1,14)==0 && S(1,15)==0 && S(1,16)==1
   x_decimal(1,4)=1;
elseif S(1,13)==0 && S(1,14)==0 && S(1,15)==1 && S(1,16)==0
   x_decimal(1,4)=2;
elseif S(1,13)==0 && S(1,14)==0 && S(1,15)==1 && S(1,16)==1
   x_decimal(1,4)=3;
elseif S(1,13)==0 && S(1,14)==1 && S(1,15)==0 && S(1,16)==0
   x_decimal(1,4)=4;
elseif S(1,13)==0 && S(1,14)==1 && S(1,15)==0 && S(1,16)==1
   x_decimal(1,4)=5;
elseif S(1,13)==0 && S(1,14)==1 && S(1,15)==1 && S(1,16)==0
   x_decimal(1,4)=6;
elseif S(1,13)==0 && S(1,14)==1 && S(1,15)==1 && S(1,16)==1
   x_decimal(1,4)=7;
elseif S(1,13)==1 && S(1,14)==0 && S(1,15)==0 && S(1,16)==0
   x_decimal(1,4)=8;
elseif S(1,13)==1 && S(1,14)==0 && S(1,15)==0 && S(1,16)==1
   x_decimal(1,4)=9;
elseif S(1,13)==1 && S(1,14)==0 && S(1,15)==1 && S(1,16)==0
```

```
    x_decimal(1,4)=10;
elseif S(1,13)==1 && S(1,14)==0 && S(1,15)==1 && S(1,16)==1
    x_decimal(1,4)=11;
elseif S(1,13)==1 && S(1,14)==1 && S(1,15)==0 && S(1,16)==0
    x_decimal(1,4)=12;
elseif S(1,13)==1 && S(1,14)==1 && S(1,15)==0 && S(1,16)==1
    x_decimal(1,4)=13;

elseif S(1,13)==1 && S(1,14)==1 && S(1,15)==1 && S(1,16)==0
    x_decimal(1,4)=14;
elseif S(1,13)==1 && S(1,14)==1 && S(1,15)==1 && S(1,16)==1
    x_decimal(1,4)=15;

end

%----------------timewindow5--------------------

if S(1,17)==0 && S(1,18)==0 && S(1,19)==0 && S(1,20)==0
    x_decimal(1,5)=0;
elseif S(1,17)==0 && S(1,18)==0 && S(1,19)==0 && S(1,20)==1
    x_decimal(1,5)=1;

elseif S(1,17)==0 && S(1,18)==0 && S(1,19)==1 && S(1,20)==0
    x_decimal(1,5)=2;

elseif S(1,17)==0 && S(1,18)==0 && S(1,19)==1 && S(1,20)==1
    x_decimal(1,5)=3;
```

```
elseif S(1,17)==0 && S(1,18)==1 && S(1,19)==0 && S(1,20)==0
   x_decimal(1,5)=4;

elseif S(1,17)==0 && S(1,18)==1 && S(1,19)==0 && S(1,20)==1
   x_decimal(1,5)=5;

elseif S(1,17)==0 && S(1,18)==1 && S(1,19)==1 && S(1,20)==0
   x_decimal(1,5)=6;

elseif S(1,17)==0 && S(1,18)==1 && S(1,19)==1 && S(1,20)==1
   x_decimal(1,5)=7;
elseif S(1,17)==1 && S(1,18)==0 && S(1,19)==0 && S(1,20)==0
   x_decimal(1,5)=8;

elseif S(1,17)==1 && S(1,18)==0 && S(1,19)==0 && S(1,20)==1
   x_decimal(1,5)=9;
elseif S(1,17)==1 && S(1,18)==0 && S(1,19)==1 && S(1,20)==0
   x_decimal(1,5)=10;
elseif S(1,17)==1 && S(1,18)==0 && S(1,19)==1 && S(1,20)==1
   x_decimal(1,5)=11;
elseif S(1,17)==1 && S(1,18)==1 && S(1,19)==0 && S(1,20)==0
   x_decimal(1,5)=12;

elseif S(1,17)==1 && S(1,18)==1 && S(1,19)==0 && S(1,20)==1
   x_decimal(1,5)=13;
elseif S(1,17)==1 && S(1,18)==1 && S(1,19)==1 && S(1,20)==0
   x_decimal(1,5)=14;
```

```
elseif S(1,17)==1 && S(1,18)==1 && S(1,19)==1 && S(1,20)==1
   x_decimal(1,5)=15;

end

%----------------timewindow6--------------------
if S(1,21)==0 && S(1,22)==0 && S(1,23)==0 && S(1,24)==0
   x_decimal(1,6)=0;
elseif S(1,21)==0 && S(1,22)==0 && S(1,23)==0 && S(1,24)==1
   x_decimal(1,6)=1;

elseif S(1,21)==0 && S(1,22)==0 && S(1,23)==1 && S(1,24)==0
   x_decimal(1,6)=2;

elseif S(1,21)==0 && S(1,22)==0 && S(1,23)==1 && S(1,24)==1
   x_decimal(1,6)=3;

elseif S(1,21)==0 && S(1,22)==1 && S(1,23)==0 && S(1,24)==0
   x_decimal(1,6)=4;

elseif S(1,21)==0 && S(1,22)==1 && S(1,23)==0 && S(1,24)==1
   x_decimal(1,6)=5;

elseif S(1,21)==0 && S(1,22)==1 && S(1,23)==1 && S(1,24)==0
   x_decimal(1,6)=6;

elseif S(1,21)==0 && S(1,22)==1 && S(1,23)==1 && S(1,24)==1
   x_decimal(1,6)=7;
```

```
elseif S(1,21)==1 && S(1,22)==0 && S(1,23)==0 && S(1,24)==0
   x_decimal(1,6)=8;

elseif S(1,21)==1 && S(1,22)==0 && S(1,23)==0 && S(1,24)==1
   x_decimal(1,6)=9;

elseif S(1,21)==1 && S(1,22)==0 && S(1,23)==1 && S(1,24)==0
   x_decimal(1,6)=10;
elseif S(1,21)==1 && S(1,22)==0 && S(1,23)==1 && S(1,24)==1
   x_decimal(1,6)=11;
elseif S(1,21)==1 && S(1,22)==1 && S(1,23)==0 && S(1,24)==0
   x_decimal(1,6)=12;

elseif S(1,21)==1 && S(1,22)==1 && S(1,23)==0 && S(1,24)==1
   x_decimal(1,6)=13;
elseif S(1,21)==1 && S(1,22)==1 && S(1,23)==1 && S(1,24)==0
   x_decimal(1,6)=14;

elseif S(1,21)==1 && S(1,22)==1 && S(1,23)==1 && S(1,24)==1
   x_decimal(1,6)=15;

end
%----------------timewindow7--------------------
if S(1,25)==0 && S(1,26)==0 && S(1,27)==0 && S(1,28)==0
   x_decimal(1,7)=0;
elseif S(1,25)==0 && S(1,26)==0 && S(1,27)==0 && S(1,28)==1
   x_decimal(1,7)=1;
```

```
elseif S(1,25)==0 && S(1,26)==0 && S(1,27)==1 && S(1,28)==0
   x_decimal(1,7)=2;

elseif S(1,25)==0 && S(1,26)==0 && S(1,27)==1 && S(1,28)==1
   x_decimal(1,7)=3;
elseif S(1,25)==0 && S(1,26)==1 && S(1,27)==0 && S(1,28)==0
   x_decimal(1,7)=4;

elseif S(1,25)==0 && S(1,26)==1 && S(1,27)==0 && S(1,28)==1
   x_decimal(1,7)=5;

elseif S(1,25)==0 && S(1,26)==1 && S(1,27)==1 && S(1,28)==0
   x_decimal(1,7)=6;

elseif S(1,25)==0 && S(1,26)==1 && S(1,27)==1 && S(1,28)==1
   x_decimal(1,7)=7;
elseif S(1,25)==1 && S(1,26)==0 && S(1,27)==0 && S(1,28)==0
   x_decimal(1,7)=8;
elseif S(1,25)==1 && S(1,26)==0 && S(1,27)==0 && S(1,28)==1
   x_decimal(1,7)=9;

elseif S(1,25)==1 && S(1,26)==0 && S(1,27)==1 && S(1,28)==0
   x_decimal(1,7)=10;

elseif S(1,25)==1 && S(1,26)==0 && S(1,27)==1 && S(1,28)==1
   x_decimal(1,7)=11;

elseif S(1,25)==1 && S(1,26)==1 && S(1,27)==0 && S(1,28)==0
```

```
    x_decimal(1,7)=12;
elseif S(1,25)==1 && S(1,26)==1 && S(1,27)==0 && S(1,28)==1
    x_decimal(1,7)=13;

elseif S(1,25)==1 && S(1,26)==1 && S(1,27)==1 && S(1,28)==0
    x_decimal(1,7)=14;

elseif S(1,25)==1 && S(1,26)==1 && S(1,27)==1 && S(1,28)==1
    x_decimal(1,7)=15;

end
%----------------timewindow8--------------------

if S(1,29)==0 && S(1,30)==0 && S(1,31)==0 && S(1,32)==0
    x_decimal(1,8)=0;
elseif S(1,29)==0 && S(1,30)==0 && S(1,31)==0 && S(1,32)==1
    x_decimal(1,8)=1;
elseif S(1,29)==0 && S(1,30)==0 && S(1,31)==1 && S(1,32)==0
    x_decimal(1,8)=2;
elseif S(1,29)==0 && S(1,30)==0 && S(1,31)==1 && S(1,32)==1
    x_decimal(1,8)=3;

elseif S(1,29)==0 && S(1,30)==1 && S(1,31)==0 && S(1,32)==0
    x_decimal(1,8)=4;

elseif S(1,29)==0 && S(1,30)==1 && S(1,31)==0 && S(1,32)==1
    x_decimal(1,8)=5;
```

```
elseif S(1,29)==0 && S(1,30)==1 && S(1,31)==1 && S(1,32)==0
   x_decimal(1,8)=6;

elseif S(1,29)==0 && S(1,30)==1 && S(1,31)==1 && S(1,32)==1
   x_decimal(1,8)=7;
elseif S(1,29)==1 && S(1,30)==0 && S(1,31)==0 && S(1,32)==0
   x_decimal(1,8)=8;

elseif S(1,29)==1 && S(1,30)==0 && S(1,31)==0 && S(1,32)==1
   x_decimal(1,8)=9;
elseif S(1,29)==1 && S(1,30)==0 && S(1,31)==1 && S(1,32)==0
   x_decimal(1,8)=10;
elseif S(1,29)==1 && S(1,30)==0 && S(1,31)==1 && S(1,32)==1
   x_decimal(1,8)=11;
elseif S(1,29)==1 && S(1,30)==1 && S(1,31)==0 && S(1,32)==0
   x_decimal(1,8)=12;
elseif S(1,29)==1 && S(1,30)==1 && S(1,31)==0 && S(1,32)==1
   x_decimal(1,8)=13;

elseif S(1,29)==1 && S(1,30)==1 && S(1,31)==1 && S(1,32)==0
   x_decimal(1,8)=14;
elseif S(1,29)==1 && S(1,30)==1 && S(1,31)==1 && S(1,32)==1
   x_decimal(1,8)=15;

end
%----------------timewindow9--------------------
```

```
if S(1,33)==0 && S(1,34)==0 && S(1,35)==0 && S(1,36)==0
   x_decimal(1,9)=0;
elseif S(1,33)==0 && S(1,34)==0 && S(1,35)==0 && S(1,36)==1
   x_decimal(1,9)=1;
elseif S(1,33)==0 && S(1,34)==0 && S(1,35)==1 && S(1,36)==0
   x_decimal(1,9)=2;
elseif S(1,33)==0 && S(1,34)==0 && S(1,35)==1 && S(1,36)==1
   x_decimal(1,9)=3;
elseif S(1,33)==0 && S(1,34)==1 && S(1,35)==0 && S(1,36)==0
   x_decimal(1,9)=4;
elseif S(1,33)==0 && S(1,34)==1 && S(1,35)==0 && S(1,36)==1
   x_decimal(1,9)=5;
elseif S(1,33)==0 && S(1,34)==1 && S(1,35)==1 && S(1,36)==0
   x_decimal(1,9)=6;
elseif S(1,33)==0 && S(1,34)==1 && S(1,35)==1 && S(1,36)==1
   x_decimal(1,9)=7;
elseif S(1,33)==1 && S(1,34)==0 && S(1,35)==0 && S(1,36)==0
   x_decimal(1,9)=8;
elseif S(1,33)==1 && S(1,34)==0 && S(1,35)==0 && S(1,36)==1
   x_decimal(1,9)=9;
elseif S(1,33)==1 && S(1,34)==0 && S(1,35)==1 && S(1,36)==0
   x_decimal(1,9)=10;
elseif S(1,33)==1 && S(1,34)==0 && S(1,35)==1 && S(1,36)==1
   x_decimal(1,9)=11;
elseif S(1,33)==1 && S(1,34)==1 && S(1,35)==0 && S(1,36)==0
```

```
    x_decimal(1,9)=12;
elseif S(1,33)==1 && S(1,34)==1 && S(1,35)==0 && S(1,36)==1
    x_decimal(1,9)=13;
elseif S(1,33)==1 && S(1,34)==1 && S(1,35)==1 && S(1,36)==0
    x_decimal(1,9)=14;
elseif S(1,33)==1 && S(1,34)==1 && S(1,35)==1 && S(1,36)==1
    x_decimal(1,9)=15;
end
%----------------timewindow10--------------------

if S(1,37)==0 && S(1,38)==0 && S(1,39)==0 && S(1,40)==0
    x_decimal(1,10)=0;
elseif S(1,37)==0 && S(1,38)==0 && S(1,39)==0 && S(1,40)==1
    x_decimal(1,10)=1;
elseif S(1,37)==0 && S(1,38)==0 && S(1,39)==1 && S(1,40)==0
    x_decimal(1,10)=2;
elseif S(1,37)==0 && S(1,38)==0 && S(1,39)==1 && S(1,40)==1
    x_decimal(1,10)=3;
elseif S(1,37)==0 && S(1,38)==1 && S(1,39)==0 && S(1,40)==0
    x_decimal(1,10)=4;
elseif S(1,37)==0 && S(1,38)==1 && S(1,39)==0 && S(1,40)==1
    x_decimal(1,10)=5;
elseif S(1,37)==0 && S(1,38)==1 && S(1,39)==1 && S(1,40)==0
    x_decimal(1,10)=6;
elseif S(1,37)==0 && S(1,38)==1 && S(1,39)==1 && S(1,40)==1
```

```
    x_decimal(1,10)=7;
elseif S(1,37)==1 && S(1,38)==0 && S(1,39)==0 && S(1,40)==0
    x_decimal(1,10)=8;
elseif S(1,37)==1 && S(1,38)==0 && S(1,39)==0 && S(1,40)==1
    x_decimal(1,10)=9;
elseif S(1,37)==1 && S(1,38)==0 && S(1,39)==1 && S(1,40)==0
    x_decimal(1,10)=10;
elseif S(1,37)==1 && S(1,38)==0 && S(1,39)==1 && S(1,40)==1
    x_decimal(1,10)=11;
elseif S(1,37)==1 && S(1,38)==1 && S(1,39)==0 && S(1,40)==0
    x_decimal(1,10)=12;
elseif S(1,37)==1 && S(1,38)==1 && S(1,39)==0 && S(1,40)==1
    x_decimal(1,10)=13;
elseif S(1,37)==1 && S(1,38)==1 && S(1,39)==1 && S(1,40)==0
    x_decimal(1,10)=14;
elseif S(1,37)==1 && S(1,38)==1 && S(1,39)==1 && S(1,40)==1
    x_decimal(1,10)=15;
end

%----------------timewindow11--------------------

if S(1,41)==0 && S(1,42)==0 && S(1,43)==0 && S(1,44)==0
    x_decimal(1,11)=0;
elseif S(1,41)==0 && S(1,42)==0 && S(1,43)==0 && S(1,44)==1
    x_decimal(1,11)=1;
```

```
elseif S(1,41)==0 && S(1,42)==0 && S(1,43)==1 && S(1,44)==0
   x_decimal(1,11)=2;
elseif S(1,41)==0 && S(1,42)==0 && S(1,43)==1 && S(1,44)==1
   x_decimal(1,11)=3;

elseif S(1,41)==0 && S(1,42)==1 && S(1,43)==0 && S(1,44)==0
   x_decimal(1,11)=4;
elseif S(1,41)==0 && S(1,42)==1 && S(1,43)==0 && S(1,44)==1
   x_decimal(1,11)=5;

elseif S(1,41)==0 && S(1,42)==1 && S(1,43)==1 && S(1,44)==0
   x_decimal(1,11)=6;

elseif S(1,41)==0 && S(1,42)==1 && S(1,43)==1 && S(1,44)==1
   x_decimal(1,11)=7;

elseif S(1,41)==1 && S(1,42)==0 && S(1,43)==0 && S(1,44)==0
   x_decimal(1,11)=8;
elseif S(1,41)==1 && S(1,42)==0 && S(1,43)==0 && S(1,44)==1
   x_decimal(1,11)=9;
elseif S(1,41)==1 && S(1,42)==0 && S(1,43)==1 && S(1,44)==0
   x_decimal(1,11)=10;
elseif S(1,41)==1 && S(1,42)==0 && S(1,43)==1 && S(1,44)==1
   x_decimal(1,11)=11;

elseif S(1,41)==1 && S(1,42)==1 && S(1,43)==0 && S(1,44)==0
   x_decimal(1,11)=12;
```

```
elseif S(1,41)==1 && S(1,42)==1 && S(1,43)==0 && S(1,44)==1
   x_decimal(1,11)=13;
elseif S(1,41)==1 && S(1,42)==1 && S(1,43)==1 && S(1,44)==0
   x_decimal(1,11)=14;
elseif S(1,41)==1 && S(1,42)==1 && S(1,43)==1 && S(1,44)==1
   x_decimal(1,11)=15;

end
%----------------timewindow12--------------------

if S(1,45)==0 && S(1,46)==0 && S(1,47)==0 && S(1,48)==0
   x_decimal(1,12)=0;
elseif S(1,45)==0 && S(1,46)==0 && S(1,47)==0 && S(1,48)==1
   x_decimal(1,12)=1;
elseif S(1,45)==0 && S(1,46)==0 && S(1,47)==1 && S(1,48)==0
   x_decimal(1,12)=2;
elseif S(1,45)==0 && S(1,46)==0 && S(1,47)==1 && S(1,48)==1
   x_decimal(1,12)=3;
elseif S(1,45)==0 && S(1,46)==1 && S(1,47)==0 && S(1,48)==0
   x_decimal(1,12)=4;
elseif S(1,45)==0 && S(1,46)==1 && S(1,47)==0 && S(1,48)==1
   x_decimal(1,12)=5;
elseif S(1,45)==0 && S(1,46)==1 && S(1,47)==1 && S(1,48)==0
   x_decimal(1,12)=6;
elseif S(1,45)==0 && S(1,46)==1 && S(1,47)==1 && S(1,48)==1
   x_decimal(1,12)=7;
```

```
elseif S(1,45)==1 && S(1,46)==0 && S(1,47)==0 && S(1,48)==0
   x_decimal(1,12)=8;
elseif S(1,45)==1 && S(1,46)==0 && S(1,47)==0 && S(1,48)==1
   x_decimal(1,12)=9;
elseif S(1,45)==1 && S(1,46)==0 && S(1,47)==1 && S(1,48)==0
   x_decimal(1,12)=10;
elseif S(1,45)==1 && S(1,46)==0 && S(1,47)==1 && S(1,48)==1
   x_decimal(1,12)=11;
elseif S(1,45)==1 && S(1,46)==1 && S(1,47)==0 && S(1,48)==0
   x_decimal(1,12)=12;
elseif S(1,45)==1 && S(1,46)==1 && S(1,47)==0 && S(1,48)==1
   x_decimal(1,12)=13;
elseif S(1,45)==1 && S(1,46)==1 && S(1,47)==1 && S(1,48)==0
   x_decimal(1,12)=14;
elseif S(1,45)==1 && S(1,46)==1 && S(1,47)==1 && S(1,48)==1
   x_decimal(1,12)=15;
end
%----------------timewindoW13---------------------

if S(1,49)==0 && S(1,50)==0 && S(1,51)==0 && S(1,52)==0
   x_decimal(1,13)=0;
elseif S(1,49)==0 && S(1,50)==0 && S(1,51)==0 && S(1,52)==1
   x_decimal(1,13)=1;
elseif S(1,49)==0 && S(1,50)==0 && S(1,51)==1 && S(1,52)==0
   x_decimal(1,13)=2;
```

```
elseif S(1,49)==0 && S(1,50)==0 && S(1,51)==1 && S(1,52)==1
   x_decimal(1,13)=3;
elseif S(1,49)==0 && S(1,50)==1 && S(1,51)==0 && S(1,52)==0
   x_decimal(1,13)=4;
elseif S(1,49)==0 && S(1,50)==1 && S(1,51)==0 && S(1,52)==1
   x_decimal(1,13)=5;
elseif S(1,49)==0 && S(1,50)==1 && S(1,51)==1 && S(1,52)==0
   x_decimal(1,13)=6;
elseif S(1,49)==0 && S(1,50)==1 && S(1,51)==1 && S(1,52)==1
   x_decimal(1,13)=7;
elseif S(1,49)==1 && S(1,50)==0 && S(1,51)==0 && S(1,52)==0
   x_decimal(1,13)=8;

elseif S(1,49)==1 && S(1,50)==0 && S(1,51)==0 && S(1,52)==1
   x_decimal(1,13)=9;
elseif S(1,49)==1 && S(1,50)==0 && S(1,51)==1 && S(1,52)==0
   x_decimal(1,13)=10;

elseif S(1,49)==1 && S(1,50)==0 && S(1,51)==1 && S(1,52)==1
   x_decimal(1,13)=11;
elseif S(1,49)==1 && S(1,50)==1 && S(1,51)==0 && S(1,52)==0
   x_decimal(1,13)=12;

elseif S(1,49)==1 && S(1,50)==1 && S(1,51)==0 && S(1,52)==1
   x_decimal(1,13)=13;
elseif S(1,49)==1 && S(1,50)==1 && S(1,51)==1 && S(1,52)==0
```

```
    x_decimal(1,13)=14;

elseif S(1,49)==1 && S(1,50)==1 && S(1,51)==1 && S(1,52)==1
    x_decimal(1,13)=15;

end
%----------------timewindoW14--------------------
if S(1,53)==0 && S(1,54)==0 && S(1,55)==0 && S(1,56)==0
    x_decimal(1,14)=0;
elseif S(1,53)==0 && S(1,54)==0 && S(1,55)==0 && S(1,56)==1
    x_decimal(1,14)=1;
elseif S(1,53)==0 && S(1,54)==0 && S(1,55)==1 && S(1,56)==0
    x_decimal(1,14)=2;
elseif S(1,53)==0 && S(1,54)==0 && S(1,55)==1 && S(1,56)==1
    x_decimal(1,14)=3;
elseif S(1,53)==0 && S(1,54)==1 && S(1,55)==0 && S(1,56)==0
    x_decimal(1,14)=4;
elseif S(1,53)==0 && S(1,54)==1 && S(1,55)==0 && S(1,56)==1
    x_decimal(1,14)=5;
elseif S(1,53)==0 && S(1,54)==1 && S(1,55)==1 && S(1,56)==0
    x_decimal(1,14)=6;
elseif S(1,53)==0 && S(1,54)==1 && S(1,55)==1 && S(1,56)==1
    x_decimal(1,14)=7;
elseif S(1,53)==1 && S(1,54)==0 && S(1,55)==0 && S(1,56)==0
    x_decimal(1,14)=8;
elseif S(1,53)==1 && S(1,54)==0 && S(1,55)==0 && S(1,56)==1
```

```
    x_decimal(1,14)=9;
elseif S(1,53)==1 && S(1,54)==0 && S(1,55)==1 && S(1,56)==0
    x_decimal(1,14)=10;
elseif S(1,53)==1 && S(1,54)==0 && S(1,55)==1 && S(1,56)==1
    x_decimal(1,14)=11;
elseif S(1,53)==1 && S(1,54)==1 && S(1,55)==0 && S(1,56)==0
    x_decimal(1,14)=12;
elseif S(1,53)==1 && S(1,54)==1 && S(1,55)==0 && S(1,56)==1
    x_decimal(1,14)=13;
elseif S(1,53)==1 && S(1,54)==1 && S(1,55)==1 && S(1,56)==0
    x_decimal(1,14)=14;
elseif S(1,53)==1 && S(1,54)==1 && S(1,55)==1 && S(1,56)==1
    x_decimal(1,14)=15;
end

%----------------timewindow15--------------------
if S(1,57)==0 && S(1,58)==0 && S(1,59)==0 && S(1,60)==0
    x_decimal(1,15)=0;
elseif S(1,57)==0 && S(1,58)==0 && S(1,59)==0 && S(1,60)==1
    x_decimal(1,15)=1;
elseif S(1,57)==0 && S(1,58)==0 && S(1,59)==1 && S(1,60)==0
    x_decimal(1,15)=2;
elseif S(1,57)==0 && S(1,58)==0 && S(1,59)==1 && S(1,60)==1
    x_decimal(1,15)=3;
elseif S(1,57)==0 && S(1,58)==1 && S(1,59)==0 && S(1,60)==0
```

```
    x_decimal(1,15)=4;
elseif S(1,57)==0 && S(1,58)==1 && S(1,59)==0 && S(1,60)==1
    x_decimal(1,15)=5;
elseif S(1,57)==0 && S(1,58)==1 && S(1,59)==1 && S(1,60)==0
    x_decimal(1,15)=6;
elseif S(1,57)==0 && S(1,58)==1 && S(1,59)==1 && S(1,60)==1
    x_decimal(1,15)=7;

elseif S(1,57)==1 && S(1,58)==0 && S(1,59)==0 && S(1,60)==0
    x_decimal(1,15)=8;
elseif S(1,57)==1 && S(1,58)==0 && S(1,59)==0 && S(1,60)==1
    x_decimal(1,15)=9;
elseif S(1,57)==1 && S(1,58)==0 && S(1,59)==1 && S(1,60)==0
    x_decimal(1,15)=10;
elseif S(1,57)==1 && S(1,58)==0 && S(1,59)==1 && S(1,60)==1
    x_decimal(1,15)=11;
elseif S(1,57)==1 && S(1,58)==1 && S(1,59)==0 && S(1,60)==0
    x_decimal(1,15)=12;
elseif S(1,57)==1 && S(1,58)==1 && S(1,59)==0 && S(1,60)==1
    x_decimal(1,15)=13;
elseif S(1,57)==1 && S(1,58)==1 && S(1,59)==1 && S(1,60)==0
    x_decimal(1,15)=14;
elseif S(1,57)==1 && S(1,58)==1 && S(1,59)==1 && S(1,60)==1
    x_decimal(1,15)=15;

end
```

```
%----------------timewindow16--------------------
if S(1,61)==0 && S(1,62)==0 && S(1,63)==0 && S(1,64)==0
   x_decimal(1,16)=0;
elseif S(1,61)==0 && S(1,62)==0 && S(1,63)==0 && S(1,64)==1
   x_decimal(1,16)=1;
elseif S(1,61)==0 && S(1,62)==0 && S(1,63)==1 && S(1,64)==0
   x_decimal(1,16)=2;
elseif S(1,61)==0 && S(1,62)==0 && S(1,63)==1 && S(1,64)==1
   x_decimal(1,16)=3;
elseif S(1,61)==0 && S(1,62)==1 && S(1,63)==0 && S(1,64)==0
   x_decimal(1,16)=4;
elseif S(1,61)==0 && S(1,62)==1 && S(1,63)==0 && S(1,64)==1
   x_decimal(1,16)=5;
elseif S(1,61)==0 && S(1,62)==1 && S(1,63)==1 && S(1,64)==0
   x_decimal(1,16)=6;

elseif S(1,61)==0 && S(1,62)==1 && S(1,63)==1 && S(1,64)==1
   x_decimal(1,16)=7;
elseif S(1,61)==1 && S(1,62)==0 && S(1,63)==0 && S(1,64)==0
   x_decimal(1,16)=8;
elseif S(1,61)==1 && S(1,62)==0 && S(1,63)==0 && S(1,64)==1
   x_decimal(1,16)=9;
elseif S(1,61)==1 && S(1,62)==0 && S(1,63)==1 && S(1,64)==0
   x_decimal(1,16)=10;
```

```
elseif S(1,61)==1 && S(1,62)==0 && S(1,63)==1 && S(1,64)==1
   x_decimal(1,16)=11;
elseif S(1,61)==1 && S(1,62)==1 && S(1,63)==0 && S(1,64)==0
   x_decimal(1,16)=12;
elseif S(1,61)==1 && S(1,62)==1 && S(1,63)==0 && S(1,64)==1
   x_decimal(1,16)=13;
elseif S(1,61)==1 && S(1,62)==1 && S(1,63)==1 && S(1,64)==0
   x_decimal(1,16)=14;
elseif S(1,61)==1 && S(1,62)==1 && S(1,63)==1 && S(1,64)==1
   x_decimal(1,16)=15;

end

%----------------timewindow17--------------------
if S(1,65)==0 && S(1,66)==0 && S(1,67)==0 && S(1,68)==0
   x_decimal(1,17)=0;
elseif S(1,65)==0 && S(1,66)==0 && S(1,67)==0 && S(1,68)==1
   x_decimal(1,17)=1;
elseif S(1,65)==0 && S(1,66)==0 && S(1,67)==1 && S(1,68)==0
   x_decimal(1,17)=2;
elseif S(1,65)==0 && S(1,66)==0 && S(1,67)==1 && S(1,68)==1
   x_decimal(1,17)=3;
elseif S(1,65)==0 && S(1,66)==1 && S(1,67)==0 && S(1,68)==0
   x_decimal(1,17)=4;
elseif S(1,65)==0 && S(1,66)==1 && S(1,67)==0 && S(1,68)==1
   x_decimal(1,17)=5;
```

```
elseif S(1,65)==0 && S(1,66)==1 && S(1,67)==1 && S(1,68)==0
   x_decimal(1,17)=6;
elseif S(1,65)==0 && S(1,66)==1 && S(1,67)==1 && S(1,68)==1
   x_decimal(1,17)=7;
elseif S(1,65)==1 && S(1,66)==0 && S(1,67)==0 && S(1,68)==0
   x_decimal(1,17)=8;
elseif S(1,65)==1 && S(1,66)==0 && S(1,67)==0 && S(1,68)==1
   x_decimal(1,17)=9;
elseif S(1,65)==1 && S(1,66)==0 && S(1,67)==1 && S(1,68)==0
   x_decimal(1,17)=10;
elseif S(1,65)==1 && S(1,66)==0 && S(1,67)==1 && S(1,68)==1
   x_decimal(1,17)=11;
elseif S(1,65)==1 && S(1,66)==1 && S(1,67)==0 && S(1,68)==0
   x_decimal(1,17)=12;
elseif S(1,65)==1 && S(1,66)==1 && S(1,67)==0 && S(1,68)==1
   x_decimal(1,17)=13;
elseif S(1,65)==1 && S(1,66)==1 && S(1,67)==1 && S(1,68)==0
   x_decimal(1,17)=14;
elseif S(1,65)==1 && S(1,66)==1 && S(1,67)==1 && S(1,68)==1
   x_decimal(1,17)=15;

end

%----------------timewindow18--------------------
if S(1,69)==0 && S(1,70)==0 && S(1,71)==0 && S(1,72)==0
```

```
    x_decimal(1,18)=0;
elseif S(1,69)==0 && S(1,70)==0 && S(1,71)==0 && S(1,72)==1
    x_decimal(1,18)=1;
elseif S(1,69)==0 && S(1,70)==0 && S(1,71)==1 && S(1,72)==0
    x_decimal(1,18)=2;
elseif S(1,69)==0 && S(1,70)==0 && S(1,71)==1 && S(1,72)==1
    x_decimal(1,18)=3;
elseif S(1,69)==0 && S(1,70)==1 && S(1,71)==0 && S(1,72)==0
    x_decimal(1,18)=4;
elseif S(1,69)==0 && S(1,70)==1 && S(1,71)==0 && S(1,72)==1
    x_decimal(1,18)=5;
elseif S(1,69)==0 && S(1,70)==1 && S(1,71)==1 && S(1,72)==0
    x_decimal(1,18)=6;
elseif S(1,69)==0 && S(1,70)==1 && S(1,71)==1 && S(1,72)==1
    x_decimal(1,18)=7;
elseif S(1,69)==1 && S(1,70)==0 && S(1,71)==0 && S(1,72)==0
    x_decimal(1,18)=8;
elseif S(1,69)==1 && S(1,70)==0 && S(1,71)==0 && S(1,72)==1
    x_decimal(1,18)=9;
elseif S(1,69)==1 && S(1,70)==0 && S(1,71)==1 && S(1,72)==0
    x_decimal(1,18)=10;
elseif S(1,69)==1 && S(1,70)==0 && S(1,71)==1 && S(1,72)==1
    x_decimal(1,18)=11;
elseif S(1,69)==1 && S(1,70)==1 && S(1,71)==0 && S(1,72)==0
```

```
    x_decimal(1,18)=12;
elseif S(1,69)==1 && S(1,70)==1 && S(1,71)==0 && S(1,72)==1
    x_decimal(1,18)=13;
elseif S(1,69)==1 && S(1,70)==1 && S(1,71)==1 && S(1,72)==0
    x_decimal(1,18)=14;
elseif S(1,69)==1 && S(1,70)==1 && S(1,71)==1 && S(1,72)==1
    x_decimal(1,18)=15;

end

%----------------timewindow19--------------------
if S(1,73)==0 && S(1,74)==0 && S(1,75)==0 && S(1,76)==0
    x_decimal(1,19)=0;
elseif S(1,73)==0 && S(1,74)==0 && S(1,75)==0 && S(1,76)==1
    x_decimal(1,19)=1;
elseif S(1,73)==0 && S(1,74)==0 && S(1,75)==1 && S(1,76)==0
    x_decimal(1,19)=2;
elseif S(1,73)==0 && S(1,74)==0 && S(1,75)==1 && S(1,76)==1
    x_decimal(1,19)=3;
elseif S(1,73)==0 && S(1,74)==1 && S(1,75)==0 && S(1,76)==0
    x_decimal(1,19)=4;
elseif S(1,73)==0 && S(1,74)==1 && S(1,75)==0 && S(1,76)==1
    x_decimal(1,19)=5;
elseif S(1,73)==0 && S(1,74)==1 && S(1,75)==1 && S(1,76)==0
    x_decimal(1,19)=6;
elseif S(1,73)==0 && S(1,74)==1 && S(1,75)==1 && S(1,76)==1
```

```
    x_decimal(1,19)=7;
elseif S(1,73)==1 && S(1,74)==0 && S(1,75)==0 && S(1,76)==0
    x_decimal(1,19)=8;
elseif S(1,73)==1 && S(1,74)==0 && S(1,75)==0 && S(1,76)==1
    x_decimal(1,19)=9;
elseif S(1,73)==1 && S(1,74)==0 && S(1,75)==1 && S(1,76)==0
    x_decimal(1,19)=10;
elseif S(1,73)==1 && S(1,74)==0 && S(1,75)==1 && S(1,76)==1
    x_decimal(1,19)=11;
elseif S(1,73)==1 && S(1,74)==1 && S(1,75)==0 && S(1,76)==0
    x_decimal(1,19)=12;
elseif S(1,73)==1 && S(1,74)==1 && S(1,75)==0 && S(1,76)==1
    x_decimal(1,19)=13;
elseif S(1,73)==1 && S(1,74)==1 && S(1,75)==1 && S(1,76)==0
    x_decimal(1,19)=14;
elseif S(1,73)==1 && S(1,74)==1 && S(1,75)==1 && S(1,76)==1
    x_decimal(1,19)=15;
end

%----------------timewindow20--------------------

if S(1,77)==0 && S(1,78)==0 && S(1,79)==0 && S(1,80)==0
    x_decimal(1,20)=0;
elseif S(1,77)==0 && S(1,78)==0 && S(1,79)==0 && S(1,80)==1
    x_decimal(1,20)=1;
```

```
elseif S(1,77)==0 && S(1,78)==0 && S(1,79)==1 && S(1,80)==0
   x_decimal(1,20)=2;
elseif S(1,77)==0 && S(1,78)==0 && S(1,79)==1 && S(1,80)==1
   x_decimal(1,20)=3;
elseif S(1,77)==0 && S(1,78)==1 && S(1,79)==0 && S(1,80)==0
   x_decimal(1,20)=4;
elseif S(1,77)==0 && S(1,78)==1 && S(1,79)==0 && S(1,80)==1
   x_decimal(1,20)=5;
elseif S(1,77)==0 && S(1,78)==1 && S(1,79)==1 && S(1,80)==0
   x_decimal(1,20)=6;
elseif S(1,77)==0 && S(1,78)==1 && S(1,79)==1 && S(1,80)==1
   x_decimal(1,20)=7;
elseif S(1,77)==1 && S(1,78)==0 && S(1,79)==0 && S(1,80)==0
   x_decimal(1,20)=8;
elseif S(1,77)==1 && S(1,78)==0 && S(1,79)==0 && S(1,80)==1
   x_decimal(1,20)=9;
elseif S(1,77)==1 && S(1,78)==0 && S(1,79)==1 && S(1,80)==0
   x_decimal(1,20)=10;
elseif S(1,77)==1 && S(1,78)==0 && S(1,79)==1 && S(1,80)==1
   x_decimal(1,20)=11;
elseif S(1,77)==1 && S(1,78)==1 && S(1,79)==0 && S(1,80)==0
   x_decimal(1,20)=12;
elseif S(1,77)==1 && S(1,78)==1 && S(1,79)==0 && S(1,80)==1
   x_decimal(1,20)=13;
elseif S(1,77)==1 && S(1,78)==1 && S(1,79)==1 && S(1,80)==0
```

```
    x_decimal(1,20)=14;
elseif S(1,77)==1 && S(1,78)==1 && S(1,79)==1 && S(1,80)==1
    x_decimal(1,20)=15;

end

%----------------timewindow21--------------------
if S(1,81)==0 && S(1,82)==0 && S(1,83)==0 && S(1,84)==0
    x_decimal(1,21)=0;
elseif S(1,81)==0 && S(1,82)==0 && S(1,83)==0 && S(1,84)==1
    x_decimal(1,21)=1;
elseif S(1,81)==0 && S(1,82)==0 && S(1,83)==1 && S(1,84)==0
    x_decimal(1,21)=2;
elseif S(1,81)==0 && S(1,82)==0 && S(1,83)==1 && S(1,84)==1
    x_decimal(1,21)=3;
elseif S(1,81)==0 && S(1,82)==1 && S(1,83)==0 && S(1,84)==0
    x_decimal(1,21)=4;
elseif S(1,81)==0 && S(1,82)==1 && S(1,83)==0 && S(1,84)==1
    x_decimal(1,21)=5;
elseif S(1,81)==0 && S(1,82)==1 && S(1,83)==1 && S(1,84)==0
    x_decimal(1,21)=6;
elseif S(1,81)==0 && S(1,82)==1 && S(1,83)==1 && S(1,84)==1
    x_decimal(1,21)=7;
elseif S(1,81)==1 && S(1,82)==0 && S(1,83)==0 && S(1,84)==0
    x_decimal(1,21)=8;
```

```
elseif S(1,81)==1 && S(1,82)==0 && S(1,83)==0 && S(1,84)==1
   x_decimal(1,21)=9;
elseif S(1,81)==1 && S(1,82)==0 && S(1,83)==1 && S(1,84)==0
   x_decimal(1,21)=10;
elseif S(1,81)==1 && S(1,82)==0 && S(1,83)==1 && S(1,84)==1
   x_decimal(1,21)=11;
elseif S(1,81)==1 && S(1,82)==1 && S(1,83)==0 && S(1,84)==0
   x_decimal(1,21)=12;
elseif S(1,81)==1 && S(1,82)==1 && S(1,83)==0 && S(1,84)==1
   x_decimal(1,21)=13;
elseif S(1,81)==1 && S(1,82)==1 && S(1,83)==1 && S(1,84)==0
   x_decimal(1,21)=14;
elseif S(1,81)==1 && S(1,82)==1 && S(1,83)==1 && S(1,84)==1
   x_decimal(1,21)=15;

end

%----------------timewindow22--------------------
if S(1,85)==0 && S(1,86)==0 && S(1,87)==0 && S(1,88)==0
   x_decimal(1,22)=0;
elseif S(1,85)==0 && S(1,86)==0 && S(1,87)==0 && S(1,88)==1
   x_decimal(1,22)=1;
elseif S(1,85)==0 && S(1,86)==0 && S(1,87)==1 && S(1,88)==0
   x_decimal(1,22)=2;
elseif S(1,85)==0 && S(1,86)==0 && S(1,87)==1 && S(1,88)==1
```

```
    x_decimal(1,22)=3;
elseif S(1,85)==0 && S(1,86)==1 && S(1,87)==0 && S(1,88)==0
    x_decimal(1,22)=4;
elseif S(1,85)==0 && S(1,86)==1 && S(1,87)==0 && S(1,88)==1
    x_decimal(1,22)=5;
elseif S(1,85)==0 && S(1,86)==1 && S(1,87)==1 && S(1,88)==0
    x_decimal(1,22)=6;
elseif S(1,85)==0 && S(1,86)==1 && S(1,87)==1 && S(1,88)==1
    x_decimal(1,22)=7;
elseif S(1,85)==1 && S(1,86)==0 && S(1,87)==0 && S(1,88)==0
    x_decimal(1,22)=8;
elseif S(1,85)==1 && S(1,86)==0 && S(1,87)==0 && S(1,88)==1
    x_decimal(1,22)=9;
elseif S(1,85)==1 && S(1,86)==0 && S(1,87)==1 && S(1,88)==0
    x_decimal(1,22)=10;
elseif S(1,85)==1 && S(1,86)==0 && S(1,87)==1 && S(1,88)==1
    x_decimal(1,22)=11;
elseif S(1,85)==1 && S(1,86)==1 && S(1,87)==0 && S(1,88)==0
    x_decimal(1,22)=12;
elseif S(1,85)==1 && S(1,86)==1 && S(1,87)==0 && S(1,88)==1
    x_decimal(1,22)=13;
elseif S(1,85)==1 && S(1,86)==1 && S(1,87)==1 && S(1,88)==0
    x_decimal(1,22)=14;
elseif S(1,85)==1 && S(1,86)==1 && S(1,87)==1 && S(1,88)==1
    x_decimal(1,22)=15;
```

```
end

%----------------timewindow23--------------------
if S(1,89)==0 && S(1,90)==0 && S(1,91)==0 && S(1,92)==0
   x_decimal(1,23)=0;
elseif S(1,89)==0 && S(1,90)==0 && S(1,91)==0 && S(1,92)==1

   x_decimal(1,23)=1;
elseif S(1,89)==0 && S(1,90)==0 && S(1,91)==1 && S(1,92)==0
   x_decimal(1,23)=2;
elseif S(1,89)==0 && S(1,90)==0 && S(1,91)==1 && S(1,92)==1
   x_decimal(1,23)=3;
elseif S(1,89)==0 && S(1,90)==1 && S(1,91)==0 && S(1,92)==0
   x_decimal(1,23)=4;
elseif S(1,89)==0 && S(1,90)==1 && S(1,91)==0 && S(1,92)==1
   x_decimal(1,23)=5;
elseif S(1,89)==0 && S(1,90)==1 && S(1,91)==1 && S(1,92)==0
   x_decimal(1,23)=6;
elseif S(1,89)==0 && S(1,90)==1 && S(1,91)==1 && S(1,92)==1
   x_decimal(1,23)=7;
elseif S(1,89)==1 && S(1,90)==0 && S(1,91)==0 && S(1,92)==0
   x_decimal(1,23)=8;
elseif S(1,89)==1 && S(1,90)==0 && S(1,91)==0 && S(1,92)==1
   x_decimal(1,23)=9;
elseif S(1,89)==1 && S(1,90)==0 && S(1,91)==1 && S(1,92)==0
```

```
    x_decimal(1,23)=10;
elseif S(1,89)==1 && S(1,90)==0 && S(1,91)==1 && S(1,92)==1
    x_decimal(1,23)=11;
elseif S(1,89)==1 && S(1,90)==1 && S(1,91)==0 && S(1,92)==0
    x_decimal(1,23)=12;
elseif S(1,89)==1 && S(1,90)==1 && S(1,91)==0 && S(1,92)==1
    x_decimal(1,23)=13;
elseif S(1,89)==1 && S(1,90)==1 && S(1,91)==1 && S(1,92)==0
    x_decimal(1,23)=14;
elseif S(1,89)==1 && S(1,90)==1 && S(1,91)==1 && S(1,92)==1
    x_decimal(1,23)=15;

end


%----------------timewindow24--------------------
if S(1,93)==0 && S(1,94)==0 && S(1,95)==0 && S(1,96)==0
    x_decimal(1,24)=0;
elseif S(1,93)==0 && S(1,94)==0 && S(1,95)==0 && S(1,96)==1
    x_decimal(1,24)=1;
elseif S(1,93)==0 && S(1,94)==0 && S(1,95)==1 && S(1,96)==0
    x_decimal(1,24)=2;
elseif S(1,93)==0 && S(1,94)==0 && S(1,95)==1 && S(1,96)==1
    x_decimal(1,24)=3;
elseif S(1,93)==0 && S(1,94)==1 && S(1,95)==0 && S(1,96)==0
```

```
    x_decimal(1,24)=4;
elseif S(1,93)==0 && S(1,94)==1 && S(1,95)==0 && S(1,96)==1
    x_decimal(1,24)=5;
elseif S(1,93)==0 && S(1,94)==1 && S(1,95)==1 && S(1,96)==0
    x_decimal(1,24)=6;
elseif S(1,93)==0 && S(1,94)==1 && S(1,95)==1 && S(1,96)==1
    x_decimal(1,24)=7;
elseif S(1,93)==1 && S(1,94)==0 && S(1,95)==0 && S(1,96)==0
    x_decimal(1,24)=8;
elseif S(1,93)==1 && S(1,94)==0 && S(1,95)==0 && S(1,96)==1
    x_decimal(1,24)=9;
elseif S(1,93)==1 && S(1,94)==0 && S(1,95)==1 && S(1,96)==0
    x_decimal(1,24)=10;
elseif S(1,93)==1 && S(1,94)==0 && S(1,95)==1 && S(1,96)==1
    x_decimal(1,24)=11;
elseif S(1,93)==1 && S(1,94)==1 && S(1,95)==0 && S(1,96)==0
    x_decimal(1,24)=12;
elseif S(1,93)==1 && S(1,94)==1 && S(1,95)==0 && S(1,96)==1
    x_decimal(1,24)=13;
elseif S(1,93)==1 && S(1,94)==1 && S(1,95)==1 && S(1,96)==0
    x_decimal(1,24)=14;
elseif S(1,93)==1 && S(1,94)==1 && S(1,95)==1 && S(1,96)==1
    x_decimal(1,24)=15;

end
```

```
%----------------timewindow25--------------------
if S(1,97)==0 && S(1,98)==0 && S(1,99)==0 && S(1,100)==0
   x_decimal(1,25)=0;

elseif S(1,97)==0 && S(1,98)==0 && S(1,99)==0 && S(1,100)==1
   x_decimal(1,25)=1;
elseif S(1,97)==0 && S(1,98)==0 && S(1,99)==1 && S(1,100)==0
   x_decimal(1,25)=2;
elseif S(1,97)==0 && S(1,98)==0 && S(1,99)==1 && S(1,100)==1
   x_decimal(1,25)=3;
elseif S(1,97)==0 && S(1,98)==1 && S(1,99)==0 && S(1,100)==0
   x_decimal(1,25)=4;
elseif S(1,97)==0 && S(1,98)==1 && S(1,99)==0 && S(1,100)==1
   x_decimal(1,25)=5;
elseif S(1,97)==0 && S(1,98)==1 && S(1,99)==1 && S(1,100)==0
   x_decimal(1,25)=6;
elseif S(1,97)==0 && S(1,98)==1 && S(1,99)==1 && S(1,100)==1
   x_decimal(1,25)=7;
elseif S(1,97)==1 && S(1,98)==0 && S(1,99)==0 && S(1,100)==0
   x_decimal(1,25)=8;
elseif S(1,97)==1 && S(1,98)==0 && S(1,99)==0 && S(1,100)==1
   x_decimal(1,25)=9;
elseif S(1,97)==1 && S(1,98)==0 && S(1,99)==1 && S(1,100)==0
   x_decimal(1,25)=10;
elseif S(1,97)==1 && S(1,98)==0 && S(1,99)==1 && S(1,100)==1
```

```
    x_decimal(1,25)=11;
elseif S(1,97)==1 && S(1,98)==1 && S(1,99)==0 && S(1,100)==0
    x_decimal(1,25)=12;
elseif S(1,97)==1 && S(1,98)==1 && S(1,99)==0 && S(1,100)==1
    x_decimal(1,25)=13;
elseif S(1,97)==1 && S(1,98)==1 && S(1,99)==1 && S(1,100)==0
    x_decimal(1,25)=14;
elseif S(1,97)==1 && S(1,98)==1 && S(1,99)==1 && S(1,100)==1
    x_decimal(1,25)=15;

end

%----------------timewindow26--------------------
if S(1,101)==0 && S(1,102)==0 && S(1,103)==0 && S(1,104)==0
    x_decimal(1,26)=0;
elseif S(1,101)==0 && S(1,102)==0 && S(1,103)==0 && S(1,104)==1
    x_decimal(1,26)=1;
elseif S(1,101)==0 && S(1,102)==0 && S(1,103)==1 && S(1,104)==0
    x_decimal(1,26)=2;
elseif S(1,101)==0 && S(1,102)==0 && S(1,103)==1 && S(1,104)==1
    x_decimal(1,26)=3;
elseif S(1,101)==0 && S(1,102)==1 && S(1,103)==0 && S(1,104)==0
    x_decimal(1,26)=4;
elseif S(1,101)==0 && S(1,102)==1 && S(1,103)==0 && S(1,104)==1
    x_decimal(1,26)=5;
elseif S(1,101)==0 && S(1,102)==1 && S(1,103)==1 && S(1,104)==0
```

```
    x_decimal(1,26)=6;
elseif S(1,101)==0 && S(1,102)==1 && S(1,103)==1 && S(1,104)==1
    x_decimal(1,26)=7;
elseif S(1,101)==1 && S(1,102)==0 && S(1,103)==0 && S(1,104)==0
    x_decimal(1,26)=8;
elseif S(1,101)==1 && S(1,102)==0 && S(1,103)==0 && S(1,104)==1
    x_decimal(1,26)=9;
elseif S(1,101)==1 && S(1,102)==0 && S(1,103)==1 && S(1,104)==0
    x_decimal(1,26)=10;
elseif S(1,101)==1 && S(1,102)==0 && S(1,103)==1 && S(1,104)==1
    x_decimal(1,26)=11;
elseif S(1,101)==1 && S(1,102)==1 && S(1,103)==0 && S(1,104)==0
    x_decimal(1,26)=12;
elseif S(1,101)==1 && S(1,102)==1 && S(1,103)==0 && S(1,104)==1
    x_decimal(1,26)=13;
elseif S(1,101)==1 && S(1,102)==1 && S(1,103)==1 && S(1,104)==0
    x_decimal(1,26)=14;
elseif S(1,101)==1 && S(1,102)==1 && S(1,103)==1 && S(1,104)==1
    x_decimal(1,26)=15;

end

%----------------timewindow27--------------------
if S(1,105)==0 && S(1,106)==0 && S(1,107)==0 && S(1,108)==0
    x_decimal(1,27)=0;
```

```
elseif S(1,105)==0 && S(1,106)==0 && S(1,107)==0 && S(1,108)==1
   x_decimal(1,27)=1;
elseif S(1,105)==0 && S(1,106)==0 && S(1,107)==1 && S(1,108)==0
   x_decimal(1,27)=2;
elseif S(1,105)==0 && S(1,106)==0 && S(1,107)==1 && S(1,108)==1
   x_decimal(1,27)=3;
elseif S(1,105)==0 && S(1,106)==1 && S(1,107)==0 && S(1,108)==0
   x_decimal(1,27)=4;
elseif S(1,105)==0 && S(1,106)==1 && S(1,107)==0 && S(1,108)==1
   x_decimal(1,27)=5;
elseif S(1,105)==0 && S(1,106)==1 && S(1,107)==1 && S(1,108)==0
   x_decimal(1,27)=6;
elseif S(1,105)==0 && S(1,106)==1 && S(1,107)==1 && S(1,108)==1
   x_decimal(1,27)=7;
elseif S(1,105)==1 && S(1,106)==0 && S(1,107)==0 && S(1,108)==0
   x_decimal(1,27)=8;
elseif S(1,105)==1 && S(1,106)==0 && S(1,107)==0 && S(1,108)==1
   x_decimal(1,27)=9;
elseif S(1,105)==1 && S(1,106)==0 && S(1,107)==1 && S(1,108)==0
   x_decimal(1,27)=10;
elseif S(1,105)==1 && S(1,106)==0 && S(1,107)==1 && S(1,108)==1
   x_decimal(1,27)=11;
elseif S(1,105)==1 && S(1,106)==1 && S(1,107)==0 && S(1,108)==0
   x_decimal(1,27)=12;
```

```
elseif S(1,105)==1 && S(1,106)==1 && S(1,107)==0 && S(1,108)==1
   x_decimal(1,27)=13;
elseif S(1,105)==1 && S(1,106)==1 && S(1,107)==1 && S(1,108)==0
   x_decimal(1,27)=14;
elseif S(1,105)==1 && S(1,106)==1 && S(1,107)==1 && S(1,108)==1
   x_decimal(1,27)=15;

end

%----------------timewindow28--------------------
if S(1,109)==0 && S(1,110)==0 && S(1,111)==0 && S(1,112)==0
   x_decimal(1,28)=0;

elseif S(1,109)==0 && S(1,110)==0 && S(1,111)==0 && S(1,112)==1
   x_decimal(1,28)=1;
elseif S(1,109)==0 && S(1,110)==0 && S(1,111)==1 && S(1,112)==0
   x_decimal(1,28)=2;
elseif S(1,109)==0 && S(1,110)==0 && S(1,111)==1 && S(1,112)==1
   x_decimal(1,28)=3;
elseif S(1,109)==0 && S(1,110)==1 && S(1,111)==0 && S(1,112)==0
   x_decimal(1,28)=4;
elseif S(1,109)==0 && S(1,110)==1 && S(1,111)==0 && S(1,112)==1
   x_decimal(1,28)=5;
elseif S(1,109)==0 && S(1,110)==1 && S(1,111)==1 && S(1,112)==0
   x_decimal(1,28)=6;
elseif S(1,109)==0 && S(1,110)==1 && S(1,111)==1 && S(1,112)==1
```

```
    x_decimal(1,28)=7;
elseif S(1,109)==1 && S(1,110)==0 && S(1,111)==0 && S(1,112)==0
    x_decimal(1,28)=8;
elseif S(1,109)==1 && S(1,110)==0 && S(1,111)==0 && S(1,112)==1
    x_decimal(1,28)=9;
elseif S(1,109)==1 && S(1,110)==0 && S(1,111)==1 && S(1,112)==0
    x_decimal(1,28)=10;
elseif S(1,109)==1 && S(1,110)==0 && S(1,111)==1 && S(1,112)==1
    x_decimal(1,28)=11;
elseif S(1,109)==1 && S(1,110)==1 && S(1,111)==0 && S(1,112)==0
    x_decimal(1,28)=12;
elseif S(1,109)==1 && S(1,110)==1 && S(1,111)==0 && S(1,112)==1
    x_decimal(1,28)=13;
elseif S(1,109)==1 && S(1,110)==1 && S(1,111)==1 && S(1,112)==0
    x_decimal(1,28)=14;
elseif S(1,109)==1 && S(1,110)==1 && S(1,111)==1 && S(1,112)==1
    x_decimal(1,28)=15;

end

% ----------------timewindow29--------------------
if S(1,113)==0 && S(1,114)==0 && S(1,115)==0 && S(1,116)==0
    x_decimal(1,29)=0;

elseif S(1,113)==0 && S(1,114)==0 && S(1,115)==0 && S(1,116)==1
    x_decimal(1,29)=1;
```

```
elseif S(1,113)==0 && S(1,114)==0 && S(1,115)==1 && S(1,116)==0
   x_decimal(1,29)=2;
elseif S(1,113)==0 && S(1,114)==0 && S(1,115)==1 && S(1,116)==1
   x_decimal(1,29)=3;
elseif S(1,113)==0 && S(1,114)==1 && S(1,115)==0 && S(1,116)==0
   x_decimal(1,29)=4;
elseif S(1,113)==0 && S(1,114)==1 && S(1,115)==0 && S(1,116)==1
   x_decimal(1,29)=5;
elseif S(1,113)==0 && S(1,114)==1 && S(1,115)==1 && S(1,116)==0
   x_decimal(1,29)=6;
elseif S(1,113)==0 && S(1,114)==1 && S(1,115)==1 && S(1,116)==1
   x_decimal(1,29)=7;
elseif S(1,113)==1 && S(1,114)==0 && S(1,115)==0 && S(1,116)==0
   x_decimal(1,29)=8;
elseif S(1,113)==1 && S(1,114)==0 && S(1,115)==0 && S(1,116)==1
   x_decimal(1,29)=9;
elseif S(1,113)==1 && S(1,114)==0 && S(1,115)==1 && S(1,116)==0
   x_decimal(1,29)=10;
elseif S(1,113)==1 && S(1,114)==0 && S(1,115)==1 && S(1,116)==1
   x_decimal(1,29)=11;
elseif S(1,113)==1 && S(1,114)==1 && S(1,115)==0 && S(1,116)==0
   x_decimal(1,29)=12;
elseif S(1,113)==1 && S(1,114)==1 && S(1,115)==0 && S(1,116)==1
   x_decimal(1,29)=13;
```

```
elseif S(1,113)==1 && S(1,114)==1 && S(1,115)==1 && S(1,116)==0
   x_decimal(1,29)=14;
elseif S(1,113)==1 && S(1,114)==1 && S(1,115)==1 && S(1,116)==1
   x_decimal(1,29)=15;

end
% ----------------timewindow30--------------------
if S(1,117)==0 && S(1,118)==0 && S(1,119)==0 && S(1,120)==0
   x_decimal(1,30)=0;
elseif S(1,117)==0 && S(1,118)==0 && S(1,119)==0 && S(1,120)==1
   x_decimal(1,30)=1;
elseif S(1,117)==0 && S(1,118)==0 && S(1,119)==1 && S(1,120)==0
   x_decimal(1,30)=2;
elseif S(1,117)==0 && S(1,118)==0 && S(1,119)==1 && S(1,120)==1
   x_decimal(1,30)=3;
elseif S(1,117)==0 && S(1,118)==1 && S(1,119)==0 && S(1,120)==0
   x_decimal(1,30)=4;
elseif S(1,117)==0 && S(1,118)==1 && S(1,119)==0 && S(1,120)==1
   x_decimal(1,30)=5;
elseif S(1,117)==0 && S(1,118)==1 && S(1,119)==1 && S(1,120)==0
   x_decimal(1,30)=6;
elseif S(1,117)==0 && S(1,118)==1 && S(1,119)==1 && S(1,120)==1
   x_decimal(1,30)=7;
elseif S(1,117)==1 && S(1,118)==0 && S(1,119)==0 && S(1,120)==0
   x_decimal(1,30)=8;
```

```
elseif S(1,117)==1 && S(1,118)==0 && S(1,119)==0 && S(1,120)==1
   x_decimal(1,30)=9;
elseif S(1,117)==1 && S(1,118)==0 && S(1,119)==1 && S(1,120)==0
   x_decimal(1,30)=10;
elseif S(1,117)==1 && S(1,118)==0 && S(1,119)==1 && S(1,120)==1
   x_decimal(1,30)=11;
elseif S(1,117)==1 && S(1,118)==1 && S(1,119)==0 && S(1,120)==0
   x_decimal(1,30)=12;
elseif S(1,117)==1 && S(1,118)==1 && S(1,119)==0 && S(1,120)==1
   x_decimal(1,30)=13;
elseif S(1,117)==1 && S(1,118)==1 && S(1,119)==1 && S(1,120)==0
   x_decimal(1,30)=14;
elseif S(1,117)==1 && S(1,118)==1 && S(1,119)==1 && S(1,120)==1
   x_decimal(1,30)=15;
end
% ----------------timewindow31--------------------
if S(1,121)==0 && S(1,122)==0 && S(1,123)==0 && S(1,124)==0
   x_decimal(1,31)=0;
elseif S(1,121)==0 && S(1,122)==0 && S(1,123)==0 && S(1,124)==1
   x_decimal(1,31)=1;
elseif S(1,121)==0 && S(1,122)==0 && S(1,123)==1 && S(1,124)==0
   x_decimal(1,31)=2;
elseif S(1,121)==0 && S(1,122)==0 && S(1,123)==1 && S(1,124)==1
   x_decimal(1,31)=3;
elseif S(1,121)==0 && S(1,122)==1 && S(1,123)==0 && S(1,124)==0
```

```
    x_decimal(1,31)=4;
elseif S(1,121)==0 && S(1,122)==1 && S(1,123)==0 && S(1,124)==1
    x_decimal(1,31)=5;
elseif S(1,121)==0 && S(1,122)==1 && S(1,123)==1 && S(1,124)==0
    x_decimal(1,31)=6;
elseif S(1,121)==0 && S(1,122)==1 && S(1,123)==1 && S(1,124)==1
    x_decimal(1,31)=7;
elseif S(1,121)==1 && S(1,122)==0 && S(1,123)==0 && S(1,124)==0
    x_decimal(1,31)=8;
elseif S(1,121)==1 && S(1,122)==0 && S(1,123)==0 && S(1,124)==1
    x_decimal(1,31)=9;
elseif S(1,121)==1 && S(1,122)==0 && S(1,123)==1 && S(1,124)==0
    x_decimal(1,31)=10;
elseif S(1,121)==1 && S(1,122)==0 && S(1,123)==1 && S(1,124)==1
    x_decimal(1,31)=11;
elseif S(1,121)==1 && S(1,122)==1 && S(1,123)==0 && S(1,124)==0
    x_decimal(1,31)=12;
elseif S(1,121)==1 && S(1,122)==1 && S(1,123)==0 && S(1,124)==1
    x_decimal(1,31)=13;
elseif S(1,121)==1 && S(1,122)==1 && S(1,123)==1 && S(1,124)==0
    x_decimal(1,31)=14;
elseif S(1,121)==1 && S(1,122)==1 && S(1,123)==1 && S(1,124)==1
    x_decimal(1,31)=15;

end
```

- Calculate_fitness.m

```
convert_decimal;

%-----------------------------------Equation for calculate total walking distance----------
-------------


%----------------timewindow1(PEN)F0300--------------------


if S(1,1)==0 && S(1,2)==0 && S(1,3)==0 && S(1,4)==0

   validity_table(1,AT_TW1:DT_TW1)=1;
   TO-
TAL_DISTANCE1=(GATE_DISTANCE0*PE_TW1)+(TRANSIT_DISTANCE(1,x_d
eci-
mal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(1,x_decimal(1,21)+1)*PKCH_T
W1);

elseif S(1,1)==0 && S(1,2)==0 && S(1,3)==0 && S(1,4)==1

   validity_table(1,AT_TW1:DT_TW1)=2;
   TO-
TAL_DISTANCE1=(GATE_DISTANCE1*PE_TW1)+(TRANSIT_DISTANCE(2,x_d
eci-
mal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(2,x_decimal(1,21)+1)*PKCH_T
W1);

elseif S(1,1)==0 && S(1,2)==0 && S(1,3)==1 && S(1,4)==0

   validity_table(1,AT_TW1:DT_TW1)=3;
   TO-
TAL_DISTANCE1=(GATE_DISTANCE2*PE_TW1)+(TRANSIT_DISTANCE(3,x_d
eci-
mal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(3,x_decimal(1,21)+1)*PKCH_T
W1);

elseif S(1,1)==0 && S(1,2)==0 && S(1,3)==1 && S(1,4)==1

   validity_table(1,AT_TW1:DT_TW1)=4;
   TO-
TAL_DISTANCE1=(GATE_DISTANCE3*PE_TW1)+(TRANSIT_DISTANCE(4,x_d
eci-
mal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(4,x_decimal(1,21)+1)*PKCH_T
W1);

elseif S(1,1)==0 && S(1,2)==1 && S(1,3)==0 && S(1,4)==0
```

```
  validity_table(1,AT_TW1:DT_TW1)=5;
  TO-
TAL_DISTANCE1=(GATE_DISTANCE4*PE_TW1)+(TRANSIT_DISTANCE(5,x_d
eci-
mal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(5,x_decimal(1,21)+1)*PKCH_T
W1);

elseif S(1,1)==0 && S(1,2)==1 && S(1,3)==0 && S(1,4)==1

  validity_table(1,AT_TW1:DT_TW1)=6;
  TO-
TAL_DISTANCE1=(GATE_DISTANCE5*PE_TW1)+(TRANSIT_DISTANCE(6,x_d
eci-
mal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(6,x_decimal(1,21)+1)*PKCH_T
W1);

elseif S(1,1)==0 && S(1,2)==1 && S(1,3)==1 && S(1,4)==0

  validity_table(1,AT_TW1:DT_TW1)=7;
  TO-
TAL_DISTANCE1=(GATE_DISTANCE6*PE_TW1)+(TRANSIT_DISTANCE(7,x_d
eci-
mal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(7,x_decimal(1,21)+1)*PKCH_T
W1);

elseif S(1,1)==0 && S(1,2)==1 && S(1,3)==1 && S(1,4)==1

  validity_table(1,AT_TW1:DT_TW1)=8;
  TO-
TAL_DISTANCE1=(GATE_DISTANCE7*PE_TW1)+(TRANSIT_DISTANCE(8,x_d
eci-
mal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(8,x_decimal(1,21)+1)*PKCH_T
W1);

elseif S(1,1)==1 && S(1,2)==0 && S(1,3)==0 && S(1,4)==0

  validity_table(1,AT_TW1:DT_TW1)=9;
  TO-
TAL_DISTANCE1=(GATE_DISTANCE8*PE_TW1)+(TRANSIT_DISTANCE(9,x_d
eci-
mal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(9,x_decimal(1,21)+1)*PKCH_T
W1);

elseif S(1,1)==1 && S(1,2)==0 && S(1,3)==0 && S(1,4)==1

  validity_table(1,AT_TW1:DT_TW1)=10;
  TO-
TAL_DISTANCE1=(GATE_DISTANCE9*PE_TW1)+(TRANSIT_DISTANCE(10,x_
```

```
deci-
mal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(10,x_decimal(1,21)+1)*PKCH_
TW1);

elseif S(1,1)==1 && S(1,2)==0 && S(1,3)==1 && S(1,4)==0

   validity_table(1,AT_TW1:DT_TW1)=11;
   TO-
TAL_DISTANCE1=(GATE_DISTANCE10*PE_TW1)+(TRANSIT_DISTANCE(11,x
_decimal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(11,x_decimal(1,21)+1)*P
KCH_TW1);

elseif S(1,1)==1 && S(1,2)==0 && S(1,3)==1 && S(1,4)==1

   validity_table(1,AT_TW1:DT_TW1)=12;
   TO-
TAL_DISTANCE1=(GATE_DISTANCE11*PE_TW1)+(TRANSIT_DISTANCE(12,x
_decimal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(12,x_decimal(1,21)+1)*P
KCH_TW1);


elseif S(1,1)==1 && S(1,2)==1 && S(1,3)==0 && S(1,4)==0

   validity_table(1,AT_TW1:DT_TW1)=13;
   TO-
TAL_DISTANCE1=(GATE_DISTANCE12*PE_TW1)+(TRANSIT_DISTANCE(13,x
_decimal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(13,x_decimal(1,21)+1)*P
KCH_TW1);

elseif S(1,1)==1 && S(1,2)==1 && S(1,3)==0 && S(1,4)==1

   validity_table(1,AT_TW1:DT_TW1)=14;
   TO-
TAL_DISTANCE1=(GATE_DISTANCE13*PE_TW1)+(TRANSIT_DISTANCE(14,x
_decimal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(14,x_decimal(1,21)+1)*P
KCH_TW1);

elseif S(1,1)==1 && S(1,2)==1 && S(1,3)==1 && S(1,4)==0

   validity_table(1,AT_TW1:DT_TW1)=15;
   TO-
TAL_DISTANCE1=(GATE_DISTANCE14*PE_TW1)+(TRANSIT_DISTANCE(15,x
_decimal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(15,x_decimal(1,21)+1)*P
KCH_TW1);

 elseif S(1,1)==1 && S(1,2)==1 && S(1,3)==1 && S(1,4)==1

   validity_table(1,AT_TW1:DT_TW1)=16;
```

```
   TO-
TAL_DISTANCE1=(GATE_DISTANCE15*PE_TW1)+(TRANSIT_DISTANCE(16,x
_decimal(1,11)+1)*PKBK_TW1)+(TRANSIT_DISTANCE(16,x_decimal(1,21)+1)*P
KCH_TW1);

 end


%----------------timewindow2(PEN)--------------------

if S(1,5)==0 && S(1,6)==0 && S(1,7)==0 && S(1,8)==0

   validity_table(2,AT_TW2:DT_TW2)=1;
   TO-
TAL_DISTANCE2=(GATE_DISTANCE0*PE_TW2)+(TRANSIT_DISTANCE(1,x_d
eci-
mal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(1,x_decimal(1,21)+1)*PKCH_T
W2);


elseif S(1,5)==0 && S(1,6)==0 && S(1,7)==0 && S(1,8)==1

   validity_table(2,AT_TW2:DT_TW2)=2;
   TO-
TAL_DISTANCE2=(GATE_DISTANCE1*PE_TW2)+(TRANSIT_DISTANCE(2,x_d
eci-
mal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(2,x_decimal(1,21)+1)*PKCH_T
W2);

elseif S(1,5)==0 && S(1,6)==0 && S(1,7)==1 && S(1,8)==0

   validity_table(2,AT_TW2:DT_TW2)=3;
   TO-
TAL_DISTANCE2=(GATE_DISTANCE2*PE_TW2)+(TRANSIT_DISTANCE(3,x_d
eci-
mal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(3,x_decimal(1,21)+1)*PKCH_T
W2);


elseif S(1,5)==0 && S(1,6)==0 && S(1,7)==1 && S(1,8)==1

   validity_table(2,AT_TW2:DT_TW2)=4;
   TO-
TAL_DISTANCE2=(GATE_DISTANCE3*PE_TW2)+(TRANSIT_DISTANCE(4,x_d
eci-
mal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(4,x_decimal(1,21)+1)*PKCH_T
W2);

elseif S(1,5)==0 && S(1,6)==1 && S(1,7)==0 && S(1,8)==0
```

```
    validity_table(2,AT_TW2:DT_TW2)=5;
    TO-
TAL_DISTANCE2=(GATE_DISTANCE4*PE_TW2)+(TRANSIT_DISTANCE(5,x_d
eci-
mal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(5,x_decimal(1,21)+1)*PKCH_T
W2);

elseif S(1,5)==0 && S(1,6)==1 && S(1,7)==0 && S(1,8)==1

    validity_table(2,AT_TW2:DT_TW2)=6;
    TO-
TAL_DISTANCE2=(GATE_DISTANCE5*PE_TW2)+(TRANSIT_DISTANCE(6,x_d
eci-
mal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(6,x_decimal(1,21)+1)*PKCH_T
W2);

elseif S(1,5)==0 && S(1,6)==1 && S(1,7)==1 && S(1,8)==0

    validity_table(2,AT_TW2:DT_TW2)=7;
    TO-
TAL_DISTANCE2=(GATE_DISTANCE6*PE_TW2)+(TRANSIT_DISTANCE(7,x_d
eci-
mal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(7,x_decimal(1,21)+1)*PKCH_T
W2);

elseif S(1,5)==0 && S(1,6)==1 && S(1,7)==1 && S(1,8)==1

    validity_table(2,AT_TW2:DT_TW2)=8;
    TO-
TAL_DISTANCE2=(GATE_DISTANCE7*PE_TW2)+(TRANSIT_DISTANCE(8,x_d
eci-
mal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(8,x_decimal(1,21)+1)*PKCH_T
W2);

elseif S(1,5)==1 && S(1,6)==0 && S(1,7)==0 && S(1,8)==0

    validity_table(2,AT_TW2:DT_TW2)=9;
    TO-
TAL_DISTANCE2=(GATE_DISTANCE8*PE_TW2)+(TRANSIT_DISTANCE(9,x_d
eci-
mal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(9,x_decimal(1,21)+1)*PKCH_T
W2);

elseif S(1,5)==1 && S(1,6)==0 && S(1,7)==0 && S(1,8)==1

    validity_table(2,AT_TW2:DT_TW2)=10;
    TO-
TAL_DISTANCE2=(GATE_DISTANCE9*PE_TW2)+(TRANSIT_DISTANCE(10,x_
```

```
deci-
mal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(10,x_decimal(1,21)+1)*PKCH_
TW2);

elseif S(1,5)==1 && S(1,6)==0 && S(1,7)==1 && S(1,8)==0

   validity_table(2,AT_TW2:DT_TW2)=11;
   TO-
TAL_DISTANCE2=(GATE_DISTANCE10*PE_TW2)+(TRANSIT_DISTANCE(11,x
_decimal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(11,x_decimal(1,21)+1)*P
KCH_TW2);

elseif S(1,5)==1 && S(1,6)==0 && S(1,7)==1 && S(1,8)==1

   validity_table(2,AT_TW2:DT_TW2)=12;
   TO-
TAL_DISTANCE2=(GATE_DISTANCE11*PE_TW2)+(TRANSIT_DISTANCE(12,x
_decimal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(12,x_decimal(1,21)+1)*P
KCH_TW2);

elseif S(1,5)==1 && S(1,6)==1 && S(1,7)==0 && S(1,8)==0

   validity_table(2,AT_TW2:DT_TW2)=13;
   TO-
TAL_DISTANCE2=(GATE_DISTANCE12*PE_TW2)+(TRANSIT_DISTANCE(13,x
_decimal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(13,x_decimal(1,21)+1)*P
KCH_TW2);

elseif S(1,5)==1 && S(1,6)==1 && S(1,7)==0 && S(1,8)==1

   validity_table(2,AT_TW2:DT_TW2)=14;
   TO-
TAL_DISTANCE2=(GATE_DISTANCE13*PE_TW2)+(TRANSIT_DISTANCE(14,x
_decimal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(14,x_decimal(1,21)+1)*P
KCH_TW2);

elseif S(1,5)==1 && S(1,6)==1 && S(1,7)==1 && S(1,8)==0

   validity_table(2,AT_TW2:DT_TW2)=15;
   TO-
TAL_DISTANCE2=(GATE_DISTANCE14*PE_TW2)+(TRANSIT_DISTANCE(15,x
_decimal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(15,x_decimal(1,21)+1)*P
KCH_TW2);


elseif S(1,5)==1 && S(1,6)==1 && S(1,7)==1 && S(1,8)==1

   validity_table(2,AT_TW2:DT_TW2)=16;
```

```
    TO-
TAL_DISTANCE2=(GATE_DISTANCE15*PE_TW2)+(TRANSIT_DISTANCE(16,x
_decimal(1,11)+1)*PKBK_TW2)+(TRANSIT_DISTANCE(16,x_decimal(1,21)+1)*P
KCH_TW2);


end


%----------------timewindow3(PEN)--------------------

if S(1,9)==0 && S(1,10)==0 && S(1,11)==0 && S(1,12)==0

    validity_table(3,AT_TW3:DT_TW3)=1;
    TO-
TAL_DISTANCE3=(GATE_DISTANCE0*PE_TW3)+(TRANSIT_DISTANCE(1,x_d
eci-
mal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(1,x_decimal(1,21)+1)*PKCH_T
W3);


elseif S(1,9)==0 && S(1,10)==0 && S(1,11)==0 && S(1,12)==1

    validity_table(3,AT_TW3:DT_TW3)=2;
    TO-
TAL_DISTANCE3=(GATE_DISTANCE1*PE_TW3)+(TRANSIT_DISTANCE(2,x_d
eci-
mal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(2,x_decimal(1,21)+1)*PKCH_T
W3);

elseif S(1,9)==0 && S(1,10)==0 && S(1,11)==1 && S(1,12)==0

    validity_table(3,AT_TW3:DT_TW3)=3;
    TO-
TAL_DISTANCE3=(GATE_DISTANCE2*PE_TW3)+(TRANSIT_DISTANCE(3,x_d
eci-
mal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(3,x_decimal(1,21)+1)*PKCH_T
W3);


elseif S(1,9)==0 && S(1,10)==0 && S(1,11)==1 && S(1,12)==1

    validity_table(3,AT_TW3:DT_TW3)=4;
    TO-
TAL_DISTANCE3=(GATE_DISTANCE3*PE_TW3)+(TRANSIT_DISTANCE(4,x_d
eci-
mal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(4,x_decimal(1,21)+1)*PKCH_T
W3);
```

```
elseif S(1,9)==0 && S(1,10)==1 && S(1,11)==0 && S(1,12)==0

   validity_table(3,AT_TW3:DT_TW3)=5;
   TO-
TAL_DISTANCE3=(GATE_DISTANCE4*PE_TW3)+(TRANSIT_DISTANCE(5,x_d
eci-
mal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(5,x_decimal(1,21)+1)*PKCH_T
W3);


elseif S(1,9)==0 && S(1,10)==1 && S(1,11)==0 && S(1,12)==1

   validity_table(3,AT_TW3:DT_TW3)=6;
   TO-
TAL_DISTANCE3=(GATE_DISTANCE5*PE_TW3)+(TRANSIT_DISTANCE(6,x_d
eci-
mal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(6,x_decimal(1,21)+1)*PKCH_T
W3);


elseif S(1,9)==0 && S(1,10)==1 && S(1,11)==1 && S(1,12)==0

   validity_table(3,AT_TW3:DT_TW3)=7;
   TO-
TAL_DISTANCE3=(GATE_DISTANCE6*PE_TW3)+(TRANSIT_DISTANCE(7,x_d
eci-
mal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(7,x_decimal(1,21)+1)*PKCH_T
W3);

elseif S(1,9)==0 && S(1,10)==1 && S(1,11)==1 && S(1,12)==1

   validity_table(3,AT_TW3:DT_TW3)=8;
   TO-
TAL_DISTANCE3=(GATE_DISTANCE7*PE_TW3)+(TRANSIT_DISTANCE(8,x_d
eci-
mal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(8,x_decimal(1,21)+1)*PKCH_T
W3);

elseif S(1,9)==1 && S(1,10)==0 && S(1,11)==0 && S(1,12)==0

   validity_table(3,AT_TW3:DT_TW3)=9;
   TO-
TAL_DISTANCE3=(GATE_DISTANCE8*PE_TW3)+(TRANSIT_DISTANCE(9,x_d
eci-
mal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(9,x_decimal(1,21)+1)*PKCH_T
W3);

elseif S(1,9)==1 && S(1,10)==0 && S(1,11)==0 && S(1,12)==1
```

```
    validity_table(3,AT_TW3:DT_TW3)=10;
    TO-
TAL_DISTANCE3=(GATE_DISTANCE9*PE_TW3)+(TRANSIT_DISTANCE(10,x_
deci-
mal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(10,x_decimal(1,21)+1)*PKCH_
TW3);

elseif S(1,9)==1 && S(1,10)==0 && S(1,11)==1 && S(1,12)==0

    validity_table(3,AT_TW3:DT_TW3)=11;
    TO-
TAL_DISTANCE3=(GATE_DISTANCE10*PE_TW3)+(TRANSIT_DISTANCE(11,x
_decimal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(11,x_decimal(1,21)+1)*P
KCH_TW3);

elseif S(1,9)==1 && S(1,10)==0 && S(1,11)==1 && S(1,12)==1

    validity_table(3,AT_TW3:DT_TW3)=12;
    TO-
TAL_DISTANCE3=(GATE_DISTANCE11*PE_TW3)+(TRANSIT_DISTANCE(12,x
_decimal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(12,x_decimal(1,21)+1)*P
KCH_TW3);

elseif S(1,9)==1 && S(1,10)==1 && S(1,11)==0 && S(1,12)==0

    validity_table(3,AT_TW3:DT_TW3)=13;
    TO-
TAL_DISTANCE3=(GATE_DISTANCE12*PE_TW3)+(TRANSIT_DISTANCE(13,x
_decimal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(13,x_decimal(1,21)+1)*P
KCH_TW3);

elseif S(1,9)==1 && S(1,10)==1 && S(1,11)==0 && S(1,12)==1

    validity_table(3,AT_TW3:DT_TW3)=14;
    TO-
TAL_DISTANCE3=(GATE_DISTANCE13*PE_TW3)+(TRANSIT_DISTANCE(14,x
_decimal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(14,x_decimal(1,21)+1)*P
KCH_TW3);

elseif S(1,9)==1 && S(1,10)==1 && S(1,11)==1 && S(1,12)==0

    validity_table(3,AT_TW3:DT_TW3)=15;
    TO-
TAL_DISTANCE3=(GATE_DISTANCE14*PE_TW3)+(TRANSIT_DISTANCE(15,x
_decimal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(15,x_decimal(1,21)+1)*P
KCH_TW3);

elseif S(1,9)==1 && S(1,10)==1 && S(1,11)==1 && S(1,12)==1
```

```
   validity_table(3,AT_TW3:DT_TW3)=16;
   TO-
TAL_DISTANCE3=(GATE_DISTANCE15*PE_TW3)+(TRANSIT_DISTANCE(16,x
_decimal(1,11)+1)*PKBK_TW3)+(TRANSIT_DISTANCE(16,x_decimal(1,21)+1)*P
KCH_TW3);

end


%----------------timewindow4(PEN)--------------------


if S(1,13)==0 && S(1,14)==0 && S(1,15)==0 && S(1,16)==0

   validity_table(4,AT_TW4:DT_TW4)=1;
   TO-
TAL_DISTANCE4=(GATE_DISTANCE0*PE_TW4)+(TRANSIT_DISTANCE(1,x_d
eci-
mal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(1,x_decimal(1,22)+1)*PKCH_T
W4);

elseif S(1,13)==0 && S(1,14)==0 && S(1,15)==0 && S(1,16)==1

   validity_table(4,AT_TW4:DT_TW4)=2;
   TO-
TAL_DISTANCE4=(GATE_DISTANCE1*PE_TW4)+(TRANSIT_DISTANCE(2,x_d
eci-
mal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(2,x_decimal(1,22)+1)*PKCH_T
W4);

elseif S(1,13)==0 && S(1,14)==0 && S(1,15)==1 && S(1,16)==0

   validity_table(4,AT_TW4:DT_TW4)=3;
   TO-
TAL_DISTANCE4=(GATE_DISTANCE2*PE_TW4)+(TRANSIT_DISTANCE(3,x_d
eci-
mal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(3,x_decimal(1,22)+1)*PKCH_T
W4);

elseif S(1,13)==0 && S(1,14)==0 && S(1,15)==1 && S(1,16)==1

   validity_table(4,AT_TW4:DT_TW4)=4;
   TO-
TAL_DISTANCE4=(GATE_DISTANCE3*PE_TW4)+(TRANSIT_DISTANCE(4,x_d
eci-
mal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(4,x_decimal(1,22)+1)*PKCH_T
W4);
```

```
elseif S(1,13)==0 && S(1,14)==1 && S(1,15)==0 && S(1,16)==0

   validity_table(4,AT_TW4:DT_TW4)=5;
   TO-
TAL_DISTANCE4=(GATE_DISTANCE4*PE_TW4)+(TRANSIT_DISTANCE(5,x_d
eci-
mal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(5,x_decimal(1,22)+1)*PKCH_T
W4);

elseif S(1,13)==0 && S(1,14)==1 && S(1,15)==0 && S(1,16)==1

   validity_table(4,AT_TW4:DT_TW4)=6;
   TO-
TAL_DISTANCE4=(GATE_DISTANCE5*PE_TW4)+(TRANSIT_DISTANCE(6,x_d
eci-
mal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(6,x_decimal(1,22)+1)*PKCH_T
W4);

elseif S(1,13)==0 && S(1,14)==1 && S(1,15)==1 && S(1,16)==0

   validity_table(4,AT_TW4:DT_TW4)=7;
   TO-
TAL_DISTANCE4=(GATE_DISTANCE6*PE_TW4)+(TRANSIT_DISTANCE(7,x_d
eci-
mal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(7,x_decimal(1,22)+1)*PKCH_T
W4);

elseif S(1,13)==0 && S(1,14)==1 && S(1,15)==1 && S(1,16)==1

   validity_table(4,AT_TW4:DT_TW4)=8;
   TO-
TAL_DISTANCE4=(GATE_DISTANCE7*PE_TW4)+(TRANSIT_DISTANCE(8,x_d
eci-
mal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(8,x_decimal(1,22)+1)*PKCH_T
W4);

elseif S(1,13)==1 && S(1,14)==0 && S(1,15)==0 && S(1,16)==0

   validity_table(4,AT_TW4:DT_TW4)=9;
   TO-
TAL_DISTANCE4=(GATE_DISTANCE8*PE_TW4)+(TRANSIT_DISTANCE(9,x_d
eci-
mal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(9,x_decimal(1,22)+1)*PKCH_T
W4);

elseif S(1,13)==1 && S(1,14)==0 && S(1,15)==0 && S(1,16)==1

   validity_table(4,AT_TW4:DT_TW4)=10;
```

```
    TO-
TAL_DISTANCE4=(GATE_DISTANCE9*PE_TW4)+(TRANSIT_DISTANCE(10,x_
deci-
mal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(10,x_decimal(1,22)+1)*PKCH_
TW4);

elseif S(1,13)==1 && S(1,14)==0 && S(1,15)==1 && S(1,16)==0

    validity_table(4,AT_TW4:DT_TW4)=11;
    TO-
TAL_DISTANCE4=(GATE_DISTANCE10*PE_TW4)+(TRANSIT_DISTANCE(11,x
_decimal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(11,x_decimal(1,22)+1)*P
KCH_TW4);

elseif S(1,13)==1 && S(1,14)==0 && S(1,15)==1 && S(1,16)==1

    validity_table(4,AT_TW4:DT_TW4)=12;
    TO-
TAL_DISTANCE4=(GATE_DISTANCE11*PE_TW4)+(TRANSIT_DISTANCE(12,x
_decimal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(12,x_decimal(1,22)+1)*P
KCH_TW4);

elseif S(1,13)==1 && S(1,14)==1 && S(1,15)==0 && S(1,16)==0

    validity_table(4,AT_TW4:DT_TW4)=13;
    TO-
TAL_DISTANCE4=(GATE_DISTANCE12*PE_TW4)+(TRANSIT_DISTANCE(13,x
_decimal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(13,x_decimal(1,22)+1)*P
KCH_TW4);

elseif S(1,13)==1 && S(1,14)==1 && S(1,15)==0 && S(1,16)==1

    validity_table(4,AT_TW4:DT_TW4)=14;
    TO-
TAL_DISTANCE4=(GATE_DISTANCE13*PE_TW4)+(TRANSIT_DISTANCE(14,x
_decimal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(14,x_decimal(1,22)+1)*P
KCH_TW4);


elseif S(1,13)==1 && S(1,14)==1 && S(1,15)==1 && S(1,16)==0

    validity_table(4,AT_TW4:DT_TW4)=15;
    TO-
TAL_DISTANCE4=(GATE_DISTANCE14*PE_TW4)+(TRANSIT_DISTANCE(15,x
_decimal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(15,x_decimal(1,22)+1)*P
KCH_TW4);

elseif S(1,13)==1 && S(1,14)==1 && S(1,15)==1 && S(1,16)==1
```

```
   validity_table(4,AT_TW4:DT_TW4)=16;
   TO-
TAL_DISTANCE4=(GATE_DISTANCE15*PE_TW4)+(TRANSIT_DISTANCE(16,x
_decimal(1,12)+1)*PKBK_TW4)+(TRANSIT_DISTANCE(16,x_decimal(1,22)+1)*P
KCH_TW4);


end


%----------------timewindow5(PEN)--------------------

if S(1,17)==0 && S(1,18)==0 && S(1,19)==0 && S(1,20)==0

   validity_table(5,AT_TW5:DT_TW5)=1;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE0*PE_TW5)+(TRANSIT_DISTANCE(1,x_d
eci-
mal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(1,x_decimal(1,24)+1)*PKCH_T
W5);

elseif S(1,17)==0 && S(1,18)==0 && S(1,19)==0 && S(1,20)==1

   validity_table(5,AT_TW5:DT_TW5)=2;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE1*PE_TW5)+(TRANSIT_DISTANCE(2,x_d
eci-
mal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(2,x_decimal(1,24)+1)*PKCH_T
W5);


elseif S(1,17)==0 && S(1,18)==0 && S(1,19)==1 && S(1,20)==0

   validity_table(5,AT_TW5:DT_TW5)=3;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE2*PE_TW5)+(TRANSIT_DISTANCE(3,x_d
eci-
mal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(3,x_decimal(1,24)+1)*PKCH_T
W5);

elseif S(1,17)==0 && S(1,18)==0 && S(1,19)==1 && S(1,20)==1

   validity_table(5,AT_TW5:DT_TW5)=4;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE3*PE_TW5)+(TRANSIT_DISTANCE(4,x_d
eci-
mal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(4,x_decimal(1,24)+1)*PKCH_T
W5);
```

```
elseif S(1,17)==0 && S(1,18)==1 && S(1,19)==0 && S(1,20)==0

   validity_table(5,AT_TW5:DT_TW5)=5;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE4*PE_TW5)+(TRANSIT_DISTANCE(5,x_d
eci-
mal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(5,x_decimal(1,24)+1)*PKCH_T
W5);


elseif S(1,17)==0 && S(1,18)==1 && S(1,19)==0 && S(1,20)==1

   validity_table(5,AT_TW5:DT_TW5)=6;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE5*PE_TW5)+(TRANSIT_DISTANCE(6,x_d
eci-
mal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(6,x_decimal(1,24)+1)*PKCH_T
W5);


elseif S(1,17)==0 && S(1,18)==1 && S(1,19)==1 && S(1,20)==0

   validity_table(5,AT_TW5:DT_TW5)=7;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE6*PE_TW5)+(TRANSIT_DISTANCE(7,x_d
eci-
mal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(7,x_decimal(1,24)+1)*PKCH_T
W5);


elseif S(1,17)==0 && S(1,18)==1 && S(1,19)==1 && S(1,20)==1

   validity_table(5,AT_TW5:DT_TW5)=8;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE7*PE_TW5)+(TRANSIT_DISTANCE(8,x_d
eci-
mal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(8,x_decimal(1,24)+1)*PKCH_T
W5);

elseif S(1,17)==1 && S(1,18)==0 && S(1,19)==0 && S(1,20)==0

   validity_table(5,AT_TW5:DT_TW5)=9;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE8*PE_TW5)+(TRANSIT_DISTANCE(9,x_d
eci-
mal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(9,x_decimal(1,24)+1)*PKCH_T
W5);
```

```
elseif S(1,17)==1 && S(1,18)==0 && S(1,19)==0 && S(1,20)==1

   validity_table(5,AT_TW5:DT_TW5)=10;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE9*PE_TW5)+(TRANSIT_DISTANCE(10,x_
deci-
mal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(10,x_decimal(1,24)+1)*PKCH_
TW5);


elseif S(1,17)==1 && S(1,18)==0 && S(1,19)==1 && S(1,20)==0

   validity_table(5,AT_TW5:DT_TW5)=11;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE10*PE_TW5)+(TRANSIT_DISTANCE(11,x
_decimal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(11,x_decimal(1,24)+1)*P
KCH_TW5);


elseif S(1,17)==1 && S(1,18)==0 && S(1,19)==1 && S(1,20)==1

   validity_table(5,AT_TW5:DT_TW5)=12;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE11*PE_TW5)+(TRANSIT_DISTANCE(12,x
_decimal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(12,x_decimal(1,24)+1)*P
KCH_TW5);


elseif S(1,17)==1 && S(1,18)==1 && S(1,19)==0 && S(1,20)==0

   validity_table(5,AT_TW5:DT_TW5)=13;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE12*PE_TW5)+(TRANSIT_DISTANCE(13,x
_decimal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(13,x_decimal(1,24)+1)*P
KCH_TW5);


elseif S(1,17)==1 && S(1,18)==1 && S(1,19)==0 && S(1,20)==1

   validity_table(5,AT_TW5:DT_TW5)=14;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE13*PE_TW5)+(TRANSIT_DISTANCE(14,x
_decimal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(14,x_decimal(1,24)+1)*P
KCH_TW5);


elseif S(1,17)==1 && S(1,18)==1 && S(1,19)==1 && S(1,20)==0
```

```
   validity_table(5,AT_TW5:DT_TW5)=15;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE14*PE_TW5)+(TRANSIT_DISTANCE(15,x
_decimal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(15,x_decimal(1,24)+1)*P
KCH_TW5);


elseif S(1,17)==1 && S(1,18)==1 && S(1,19)==1 && S(1,20)==1

   validity_table(5,AT_TW5:DT_TW5)=16;
   TO-
TAL_DISTANCE5=(GATE_DISTANCE15*PE_TW5)+(TRANSIT_DISTANCE(16,x
_decimal(1,13)+1)*PKBK_TW5)+(TRANSIT_DISTANCE(16,x_decimal(1,24)+1)*P
KCH_TW5);


end


%----------------timewindow6(PEN)--------------------


if S(1,21)==0 && S(1,22)==0 && S(1,23)==0 && S(1,24)==0

   validity_table(6,AT_TW6:DT_TW6)=1;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE0*PE_TW6)+(TRANSIT_DISTANCE(1,x_d
eci-
mal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(1,x_decimal(1,26)+1)*PKCH_T
W6);

elseif S(1,21)==0 && S(1,22)==0 && S(1,23)==0 && S(1,24)==1

   validity_table(6,AT_TW6:DT_TW6)=2;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE1*PE_TW6)+(TRANSIT_DISTANCE(2,x_d
eci-
mal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(2,x_decimal(1,26)+1)*PKCH_T
W6);


elseif S(1,21)==0 && S(1,22)==0 && S(1,23)==1 && S(1,24)==0

   validity_table(6,AT_TW6:DT_TW6)=3;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE2*PE_TW6)+(TRANSIT_DISTANCE(3,x_d
eci-
mal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(3,x_decimal(1,26)+1)*PKCH_T
W6);
```

```
elseif S(1,21)==0 && S(1,22)==0 && S(1,23)==1 && S(1,24)==1

   validity_table(6,AT_TW6:DT_TW6)=4;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE3*PE_TW6)+(TRANSIT_DISTANCE(4,x_d
eci-
mal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(4,x_decimal(1,26)+1)*PKCH_T
W6);


elseif S(1,21)==0 && S(1,22)==1 && S(1,23)==0 && S(1,24)==0

   validity_table(6,AT_TW6:DT_TW6)=5;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE4*PE_TW6)+(TRANSIT_DISTANCE(5,x_d
eci-
mal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(5,x_decimal(1,26)+1)*PKCH_T
W6);


elseif S(1,21)==0 && S(1,22)==1 && S(1,23)==0 && S(1,24)==1

   validity_table(6,AT_TW6:DT_TW6)=6;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE5*PE_TW6)+(TRANSIT_DISTANCE(6,x_d
eci-
mal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(6,x_decimal(1,26)+1)*PKCH_T
W6);


elseif S(1,21)==0 && S(1,22)==1 && S(1,23)==1 && S(1,24)==0

   validity_table(6,AT_TW6:DT_TW6)=7;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE6*PE_TW6)+(TRANSIT_DISTANCE(7,x_d
eci-
mal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(7,x_decimal(1,26)+1)*PKCH_T
W6);


elseif S(1,21)==0 && S(1,22)==1 && S(1,23)==1 && S(1,24)==1

   validity_table(6,AT_TW6:DT_TW6)=8;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE7*PE_TW6)+(TRANSIT_DISTANCE(8,x_d
eci-
```

```
mal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(8,x_decimal(1,26)+1)*PKCH_T
W6);


elseif S(1,21)==1 && S(1,22)==0 && S(1,23)==0 && S(1,24)==0

   validity_table(6,AT_TW6:DT_TW6)=9;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE8*PE_TW6)+(TRANSIT_DISTANCE(9,x_d
eci-
mal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(9,x_decimal(1,26)+1)*PKCH_T
W6);


elseif S(1,21)==1 && S(1,22)==0 && S(1,23)==0 && S(1,24)==1

   validity_table(6,AT_TW6:DT_TW6)=10;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE9*PE_TW6)+(TRANSIT_DISTANCE(10,x_
deci-
mal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(10,x_decimal(1,26)+1)*PKCH_
TW6);


elseif S(1,21)==1 && S(1,22)==0 && S(1,23)==1 && S(1,24)==0

   validity_table(6,AT_TW6:DT_TW6)=11;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE10*PE_TW6)+(TRANSIT_DISTANCE(11,x
_decimal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(11,x_decimal(1,26)+1)*P
KCH_TW6);

elseif S(1,21)==1 && S(1,22)==0 && S(1,23)==1 && S(1,24)==1

   validity_table(6,AT_TW6:DT_TW6)=12;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE11*PE_TW6)+(TRANSIT_DISTANCE(12,x
_decimal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(12,x_decimal(1,26)+1)*P
KCH_TW6);

elseif S(1,21)==1 && S(1,22)==1 && S(1,23)==0 && S(1,24)==0

   validity_table(6,AT_TW6:DT_TW6)=13;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE12*PE_TW6)+(TRANSIT_DISTANCE(13,x
_decimal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(13,x_decimal(1,26)+1)*P
KCH_TW6);
```

```
elseif S(1,21)==1 && S(1,22)==1 && S(1,23)==0 && S(1,24)==1

   validity_table(6,AT_TW6:DT_TW6)=14;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE13*PE_TW6)+(TRANSIT_DISTANCE(14,x
_decimal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(14,x_decimal(1,26)+1)*P
KCH_TW6);

elseif S(1,21)==1 && S(1,22)==1 && S(1,23)==1 && S(1,24)==0

   validity_table(6,AT_TW6:DT_TW6)=15;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE14*PE_TW6)+(TRANSIT_DISTANCE(15,x
_decimal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(15,x_decimal(1,26)+1)*P
KCH_TW6);


elseif S(1,21)==1 && S(1,22)==1 && S(1,23)==1 && S(1,24)==1

   validity_table(6,AT_TW6:DT_TW6)=16;
   TO-
TAL_DISTANCE6=(GATE_DISTANCE15*PE_TW6)+(TRANSIT_DISTANCE(16,x
_decimal(1,15)+1)*PKBK_TW6)+(TRANSIT_DISTANCE(16,x_decimal(1,26)+1)*P
KCH_TW6);


end


%----------------timewindow7(PEN)--------------------


if S(1,25)==0 && S(1,26)==0 && S(1,27)==0 && S(1,28)==0

   validity_table(7,AT_TW7:DT_TW7)=1;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE0*PE_TW7)+(TRANSIT_DISTANCE(1,x_d
eci-
mal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(1,x_decimal(1,27)+1)*PKCH_T
W7);

elseif S(1,25)==0 && S(1,26)==0 && S(1,27)==0 && S(1,28)==1

   validity_table(7,AT_TW7:DT_TW7)=2;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE1*PE_TW7)+(TRANSIT_DISTANCE(2,x_d
eci-
mal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(2,x_decimal(1,27)+1)*PKCH_T
W7);
```

```
elseif S(1,25)==0 && S(1,26)==0 && S(1,27)==1 && S(1,28)==0

   validity_table(7,AT_TW7:DT_TW7)=3;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE2*PE_TW7)+(TRANSIT_DISTANCE(3,x_d
eci-
mal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(3,x_decimal(1,27)+1)*PKCH_T
W7);


elseif S(1,25)==0 && S(1,26)==0 && S(1,27)==1 && S(1,28)==1

   validity_table(7,AT_TW7:DT_TW7)=4;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE3*PE_TW7)+(TRANSIT_DISTANCE(4,x_d
eci-
mal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(4,x_decimal(1,27)+1)*PKCH_T
W7);


elseif S(1,25)==0 && S(1,26)==1 && S(1,27)==0 && S(1,28)==0

   validity_table(7,AT_TW7:DT_TW7)=5;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE4*PE_TW7)+(TRANSIT_DISTANCE(5,x_d
eci-
mal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(5,x_decimal(1,27)+1)*PKCH_T
W7);


elseif S(1,25)==0 && S(1,26)==1 && S(1,27)==0 && S(1,28)==1

   validity_table(7,AT_TW7:DT_TW7)=6;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE5*PE_TW7)+(TRANSIT_DISTANCE(6,x_d
eci-
mal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(6,x_decimal(1,27)+1)*PKCH_T
W7);


elseif S(1,25)==0 && S(1,26)==1 && S(1,27)==1 && S(1,28)==0

   validity_table(7,AT_TW7:DT_TW7)=7;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE6*PE_TW7)+(TRANSIT_DISTANCE(7,x_d
eci-
mal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(7,x_decimal(1,27)+1)*PKCH_T
W7);
```

```
elseif S(1,25)==0 && S(1,26)==1 && S(1,27)==1 && S(1,28)==1

   validity_table(7,AT_TW7:DT_TW7)=8;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE7*PE_TW7)+(TRANSIT_DISTANCE(8,x_d
eci-
mal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(8,x_decimal(1,27)+1)*PKCH_T
W7);

elseif S(1,25)==1 && S(1,26)==0 && S(1,27)==0 && S(1,28)==0

   validity_table(7,AT_TW7:DT_TW7)=9;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE8*PE_TW7)+(TRANSIT_DISTANCE(9,x_d
eci-
mal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(9,x_decimal(1,27)+1)*PKCH_T
W7);

elseif S(1,25)==1 && S(1,26)==0 && S(1,27)==0 && S(1,28)==1

   validity_table(7,AT_TW7:DT_TW7)=10;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE9*PE_TW7)+(TRANSIT_DISTANCE(10,x_
deci-
mal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(10,x_decimal(1,27)+1)*PKCH_
TW7);


elseif S(1,25)==1 && S(1,26)==0 && S(1,27)==1 && S(1,28)==0

   validity_table(7,AT_TW7:DT_TW7)=11;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE10*PE_TW7)+(TRANSIT_DISTANCE(11,x
_decimal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(11,x_decimal(1,27)+1)*P
KCH_TW7);


elseif S(1,25)==1 && S(1,26)==0 && S(1,27)==1 && S(1,28)==1

   validity_table(7,AT_TW7:DT_TW7)=12;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE11*PE_TW7)+(TRANSIT_DISTANCE(12,x
_decimal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(12,x_decimal(1,27)+1)*P
KCH_TW7);


elseif S(1,25)==1 && S(1,26)==1 && S(1,27)==0 && S(1,28)==0
```

```
   validity_table(7,AT_TW7:DT_TW7)=13;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE12*PE_TW7)+(TRANSIT_DISTANCE(13,x
_decimal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(13,x_decimal(1,27)+1)*P
KCH_TW7);

elseif S(1,25)==1 && S(1,26)==1 && S(1,27)==0 && S(1,28)==1

   validity_table(7,AT_TW7:DT_TW7)=14;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE13*PE_TW7)+(TRANSIT_DISTANCE(14,x
_decimal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(14,x_decimal(1,27)+1)*P
KCH_TW7);


elseif S(1,25)==1 && S(1,26)==1 && S(1,27)==1 && S(1,28)==0

   validity_table(7,AT_TW7:DT_TW7)=15;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE14*PE_TW7)+(TRANSIT_DISTANCE(15,x
_decimal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(15,x_decimal(1,27)+1)*P
KCH_TW7);


elseif S(1,25)==1 && S(1,26)==1 && S(1,27)==1 && S(1,28)==1

   validity_table(7,AT_TW7:DT_TW7)=16;
   TO-
TAL_DISTANCE7=(GATE_DISTANCE15*PE_TW7)+(TRANSIT_DISTANCE(16,x
_decimal(1,16)+1)*PKBK_TW7)+(TRANSIT_DISTANCE(16,x_decimal(1,27)+1)*P
KCH_TW7);


end


%----------------timewindow8(PEN)--------------------

if S(1,29)==0 && S(1,30)==0 && S(1,31)==0 && S(1,32)==0

   validity_table(8,AT_TW8:DT_TW8)=1;
   TO-
TAL_DISTANCE8=(GATE_DISTANCE0*PE_TW8)+(TRANSIT_DISTANCE(1,x_d
eci-
mal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(1,x_decimal(1,27)+1)*PKCH_T
W8);

elseif S(1,29)==0 && S(1,30)==0 && S(1,31)==0 && S(1,32)==1
```

```
    validity_table(8,AT_TW8:DT_TW8)=2;
    TO-
TAL_DISTANCE8=(GATE_DISTANCE1*PE_TW8)+(TRANSIT_DISTANCE(2,x_d
eci-
mal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(2,x_decimal(1,27)+1)*PKCH_T
W8);

elseif S(1,29)==0 && S(1,30)==0 && S(1,31)==1 && S(1,32)==0

    validity_table(8,AT_TW8:DT_TW8)=3;
    TO-
TAL_DISTANCE8=(GATE_DISTANCE2*PE_TW8)+(TRANSIT_DISTANCE(3,x_d
eci-
mal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(3,x_decimal(1,27)+1)*PKCH_T
W8);

elseif S(1,29)==0 && S(1,30)==0 && S(1,31)==1 && S(1,32)==1

    validity_table(8,AT_TW8:DT_TW8)=4;
    TO-
TAL_DISTANCE8=(GATE_DISTANCE3*PE_TW8)+(TRANSIT_DISTANCE(4,x_d
eci-
mal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(4,x_decimal(1,27)+1)*PKCH_T
W8);


elseif S(1,29)==0 && S(1,30)==1 && S(1,31)==0 && S(1,32)==0

    validity_table(8,AT_TW8:DT_TW8)=5;
    TO-
TAL_DISTANCE8=(GATE_DISTANCE4*PE_TW8)+(TRANSIT_DISTANCE(5,x_d
eci-
mal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(5,x_decimal(1,27)+1)*PKCH_T
W8);

elseif S(1,29)==0 && S(1,30)==1 && S(1,31)==0 && S(1,32)==1

    validity_table(8,AT_TW8:DT_TW8)=6;
    TO-
TAL_DISTANCE8=(GATE_DISTANCE5*PE_TW8)+(TRANSIT_DISTANCE(6,x_d
eci-
mal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(6,x_decimal(1,27)+1)*PKCH_T
W8);


elseif S(1,29)==0 && S(1,30)==1 && S(1,31)==1 && S(1,32)==0

    validity_table(8,AT_TW8:DT_TW8)=7;
```

```
    TO-
TAL_DISTANCE8=(GATE_DISTANCE6*PE_TW8)+(TRANSIT_DISTANCE(7,x_d
eci-
mal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(7,x_decimal(1,27)+1)*PKCH_T
W8);


elseif S(1,29)==0 && S(1,30)==1 && S(1,31)==1 && S(1,32)==1

    validity_table(8,AT_TW8:DT_TW8)=8;
    TO-
TAL_DISTANCE8=(GATE_DISTANCE7*PE_TW8)+(TRANSIT_DISTANCE(8,x_d
eci-
mal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(8,x_decimal(1,27)+1)*PKCH_T
W8);

elseif S(1,29)==1 && S(1,30)==0 && S(1,31)==0 && S(1,32)==0

    validity_table(8,AT_TW8:DT_TW8)=9;
    TO-
TAL_DISTANCE8=(GATE_DISTANCE8*PE_TW8)+(TRANSIT_DISTANCE(9,x_d
eci-
mal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(9,x_decimal(1,27)+1)*PKCH_T
W8);


elseif S(1,29)==1 && S(1,30)==0 && S(1,31)==0 && S(1,32)==1

    validity_table(8,AT_TW8:DT_TW8)=10;
    TO-
TAL_DISTANCE8=(GATE_DISTANCE9*PE_TW8)+(TRANSIT_DISTANCE(10,x_
deci-
mal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(10,x_decimal(1,27)+1)*PKCH_
TW8);

elseif S(1,29)==1 && S(1,30)==0 && S(1,31)==1 && S(1,32)==0

    validity_table(8,AT_TW8:DT_TW8)=11;
    TO-
TAL_DISTANCE8=(GATE_DISTANCE10*PE_TW8)+(TRANSIT_DISTANCE(11,x
_decimal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(11,x_decimal(1,27)+1)*P
KCH_TW8);

elseif S(1,29)==1 && S(1,30)==0 && S(1,31)==1 && S(1,32)==1

    validity_table(8,AT_TW8:DT_TW8)=12;
    TO-
TAL_DISTANCE8=(GATE_DISTANCE11*PE_TW8)+(TRANSIT_DISTANCE(12,x
```

```
_decimal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(12,x_decimal(1,27)+1)*P
KCH_TW8);

elseif S(1,29)==1 && S(1,30)==1 && S(1,31)==0 && S(1,32)==0

   validity_table(8,AT_TW8:DT_TW8)=13;
   TO-
TAL_DISTANCE8=(GATE_DISTANCE12*PE_TW8)+(TRANSIT_DISTANCE(13,x
_decimal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(13,x_decimal(1,27)+1)*P
KCH_TW8);

elseif S(1,29)==1 && S(1,30)==1 && S(1,31)==0 && S(1,32)==1

   validity_table(8,AT_TW8:DT_TW8)=14;
   TO-
TAL_DISTANCE8=(GATE_DISTANCE13*PE_TW8)+(TRANSIT_DISTANCE(14,x
_decimal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(14,x_decimal(1,27)+1)*P
KCH_TW8);


elseif S(1,29)==1 && S(1,30)==1 && S(1,31)==1 && S(1,32)==0

   validity_table(8,AT_TW8:DT_TW8)=15;
   TO-
TAL_DISTANCE8=(GATE_DISTANCE14*PE_TW8)+(TRANSIT_DISTANCE(15,x
_decimal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(15,x_decimal(1,27)+1)*P
KCH_TW8);

elseif S(1,29)==1 && S(1,30)==1 && S(1,31)==1 && S(1,32)==1

   validity_table(8,AT_TW8:DT_TW8)=16;
   TO-
TAL_DISTANCE8=(GATE_DISTANCE15*PE_TW8)+(TRANSIT_DISTANCE(16,x
_decimal(1,16)+1)*PKBK_TW8)+(TRANSIT_DISTANCE(16,x_decimal(1,27)+1)*P
KCH_TW8);


end


%----------------timewindow9--------------------

if S(1,33)==0 && S(1,34)==0 && S(1,35)==0 && S(1,36)==0

   validity_table(9,AT_TW9:DT_TW9)=1;
   TOTAL_DISTANCE9=(GATE_DISTANCE0*PE_TW9);

elseif S(1,33)==0 && S(1,34)==0 && S(1,35)==0 && S(1,36)==1
```

```
    validity_table(9,AT_TW9:DT_TW9)=2;
    TOTAL_DISTANCE9=(GATE_DISTANCE1*PE_TW9);

elseif S(1,33)==0 && S(1,34)==0 && S(1,35)==1 && S(1,36)==0

    validity_table(9,AT_TW9:DT_TW9)=3;
    TOTAL_DISTANCE9=(GATE_DISTANCE2*PE_TW9);

elseif S(1,33)==0 && S(1,34)==0 && S(1,35)==1 && S(1,36)==1

    validity_table(9,AT_TW9:DT_TW9)=4;
    TOTAL_DISTANCE9=(GATE_DISTANCE3*PE_TW9);

elseif S(1,33)==0 && S(1,34)==1 && S(1,35)==0 && S(1,36)==0

    validity_table(9,AT_TW9:DT_TW9)=5;
    TOTAL_DISTANCE9=(GATE_DISTANCE4*PE_TW9);

elseif S(1,33)==0 && S(1,34)==1 && S(1,35)==0 && S(1,36)==1

    validity_table(9,AT_TW9:DT_TW9)=6;
    TOTAL_DISTANCE9=(GATE_DISTANCE5*PE_TW9);

elseif S(1,33)==0 && S(1,34)==1 && S(1,35)==1 && S(1,36)==0

    validity_table(9,AT_TW9:DT_TW9)=7;
    TOTAL_DISTANCE9=(GATE_DISTANCE6*PE_TW9);

elseif S(1,33)==0 && S(1,34)==1 && S(1,35)==1 && S(1,36)==1

    validity_table(9,AT_TW9:DT_TW9)=8;
    TOTAL_DISTANCE9=(GATE_DISTANCE7*PE_TW9);

elseif S(1,33)==1 && S(1,34)==0 && S(1,35)==0 && S(1,36)==0

    validity_table(9,AT_TW9:DT_TW9)=9;
    TOTAL_DISTANCE9=(GATE_DISTANCE8*PE_TW9);

elseif S(1,33)==1 && S(1,34)==0 && S(1,35)==0 && S(1,36)==1

    validity_table(9,AT_TW9:DT_TW9)=10;
    TOTAL_DISTANCE9=(GATE_DISTANCE9*PE_TW9);

elseif S(1,33)==1 && S(1,34)==0 && S(1,35)==1 && S(1,36)==0

    validity_table(9,AT_TW9:DT_TW9)=11;
    TOTAL_DISTANCE9=(GATE_DISTANCE10*PE_TW9);

elseif S(1,33)==1 && S(1,34)==0 && S(1,35)==1 && S(1,36)==1
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```
    validity_table(9,AT_TW9:DT_TW9)=12;
    TOTAL_DISTANCE9=(GATE_DISTANCE11*PE_TW9);

elseif S(1,33)==1 && S(1,34)==1 && S(1,35)==0 && S(1,36)==0

    validity_table(9,AT_TW9:DT_TW9)=13;
    TOTAL_DISTANCE9=(GATE_DISTANCE12*PE_TW9);

elseif S(1,33)==1 && S(1,34)==1 && S(1,35)==0 && S(1,36)==1

    validity_table(9,AT_TW9:DT_TW9)=14;
    TOTAL_DISTANCE9=(GATE_DISTANCE13*PE_TW9);

elseif S(1,33)==1 && S(1,34)==1 && S(1,35)==1 && S(1,36)==0

    validity_table(9,AT_TW9:DT_TW9)=15;
    TOTAL_DISTANCE9=(GATE_DISTANCE14*PE_TW9);

elseif S(1,33)==1 && S(1,34)==1 && S(1,35)==1 && S(1,36)==1

    validity_table(9,AT_TW9:DT_TW9)=16;
    TOTAL_DISTANCE9=(GATE_DISTANCE15*PE_TW9);

end


%----------------timewindow10--------------------

if S(1,37)==0 && S(1,38)==0 && S(1,39)==0 && S(1,40)==0

    validity_table(10,AT_TW10:DT_TW10)=1;
    TOTAL_DISTANCE10=(GATE_DISTANCE0*PE_TW10);

elseif S(1,37)==0 && S(1,38)==0 && S(1,39)==0 && S(1,40)==1

    validity_table(10,AT_TW10:DT_TW10)=2;
    TOTAL_DISTANCE10=(GATE_DISTANCE1*PE_TW10);

elseif S(1,37)==0 && S(1,38)==0 && S(1,39)==1 && S(1,40)==0

    validity_table(10,AT_TW10:DT_TW10)=3;
    TOTAL_DISTANCE10=(GATE_DISTANCE2*PE_TW10);

elseif S(1,37)==0 && S(1,38)==0 && S(1,39)==1 && S(1,40)==1

    validity_table(10,AT_TW10:DT_TW10)=4;
    TOTAL_DISTANCE10=(GATE_DISTANCE3*PE_TW10);
```

```
elseif S(1,37)==0 && S(1,38)==1 && S(1,39)==0 && S(1,40)==0

   validity_table(10,AT_TW10:DT_TW10)=5;
   TOTAL_DISTANCE10=(GATE_DISTANCE4*PE_TW10);

elseif S(1,37)==0 && S(1,38)==1 && S(1,39)==0 && S(1,40)==1

   validity_table(10,AT_TW10:DT_TW10)=6;
   TOTAL_DISTANCE10=(GATE_DISTANCE5*PE_TW10);

elseif S(1,37)==0 && S(1,38)==1 && S(1,39)==1 && S(1,40)==0

   validity_table(10,AT_TW10:DT_TW10)=7;
   TOTAL_DISTANCE10=(GATE_DISTANCE6*PE_TW10);


elseif S(1,37)==0 && S(1,38)==1 && S(1,39)==1 && S(1,40)==1

   validity_table(10,AT_TW10:DT_TW10)=8;
   TOTAL_DISTANCE10=(GATE_DISTANCE7*PE_TW10);

elseif S(1,37)==1 && S(1,38)==0 && S(1,39)==0 && S(1,40)==0

   validity_table(10,AT_TW10:DT_TW10)=9;
   TOTAL_DISTANCE10=(GATE_DISTANCE8*PE_TW10);

elseif S(1,37)==1 && S(1,38)==0 && S(1,39)==0 && S(1,40)==1

   validity_table(10,AT_TW10:DT_TW10)=10;
   TOTAL_DISTANCE10=(GATE_DISTANCE9*PE_TW10);

elseif S(1,37)==1 && S(1,38)==0 && S(1,39)==1 && S(1,40)==0

   validity_table(10,AT_TW10:DT_TW10)=11;
   TOTAL_DISTANCE10=(GATE_DISTANCE10*PE_TW10);

elseif S(1,37)==1 && S(1,38)==0 && S(1,39)==1 && S(1,40)==1

   validity_table(10,AT_TW10:DT_TW10)=12;
   TOTAL_DISTANCE10=(GATE_DISTANCE11*PE_TW10);

elseif S(1,37)==1 && S(1,38)==1 && S(1,39)==0 && S(1,40)==0

   validity_table(10,AT_TW10:DT_TW10)=13;
   TOTAL_DISTANCE10=(GATE_DISTANCE12*PE_TW10);

elseif S(1,37)==1 && S(1,38)==1 && S(1,39)==0 && S(1,40)==1

   validity_table(10,AT_TW10:DT_TW10)=14;
```

```
    TOTAL_DISTANCE10=(GATE_DISTANCE13*PE_TW10);

elseif S(1,37)==1 && S(1,38)==1 && S(1,39)==1 && S(1,40)==0

    validity_table(10,AT_TW10:DT_TW10)=15;
    TOTAL_DISTANCE10=(GATE_DISTANCE14*PE_TW10);

elseif S(1,37)==1 && S(1,38)==1 && S(1,39)==1 && S(1,40)==1

    validity_table(10,AT_TW10:DT_TW10)=16;
    TOTAL_DISTANCE10=(GATE_DISTANCE15*PE_TW10);

end


%----------------timewindow11--------------------

if S(1,41)==0 && S(1,42)==0 && S(1,43)==0 && S(1,44)==0

    validity_table(11,AT_TW11:DT_TW11)=1;
    TO-
TAL_DISTANCE11=(GATE_DISTANCE0*PE_TW11)+(TRANSIT_DISTANCE(1,x
_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(1,x_decimal(1,21)+1)*PKC
H_TW11);

elseif S(1,41)==0 && S(1,42)==0 && S(1,43)==0 && S(1,44)==1

    validity_table(11,AT_TW11:DT_TW11)=2;
    TO-
TAL_DISTANCE11=(GATE_DISTANCE1*PE_TW11)+(TRANSIT_DISTANCE(2,x
_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(2,x_decimal(1,21)+1)*PKC
H_TW11);

elseif S(1,41)==0 && S(1,42)==0 && S(1,43)==1 && S(1,44)==0

    validity_table(11,AT_TW11:DT_TW11)=3;
    TO-
TAL_DISTANCE11=(GATE_DISTANCE2*PE_TW11)+(TRANSIT_DISTANCE(3,x
_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(3,x_decimal(1,21)+1)*PKC
H_TW11);

elseif S(1,41)==0 && S(1,42)==0 && S(1,43)==1 && S(1,44)==1

    validity_table(11,AT_TW11:DT_TW11)=4;
    TO-
TAL_DISTANCE11=(GATE_DISTANCE3*PE_TW11)+(TRANSIT_DISTANCE(4,x
_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(4,x_decimal(1,21)+1)*PKC
H_TW11);
```

```
elseif S(1,41)==0 && S(1,42)==1 && S(1,43)==0 && S(1,44)==0

   validity_table(11,AT_TW11:DT_TW11)=5;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE4*PE_TW11)+(TRANSIT_DISTANCE(5,x
_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(5,x_decimal(1,21)+1)*PKC
H_TW11);

elseif S(1,41)==0 && S(1,42)==1 && S(1,43)==0 && S(1,44)==1

   validity_table(11,AT_TW11:DT_TW11)=6;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE5*PE_TW11)+(TRANSIT_DISTANCE(6,x
_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(6,x_decimal(1,21)+1)*PKC
H_TW11);


elseif S(1,41)==0 && S(1,42)==1 && S(1,43)==1 && S(1,44)==0

   validity_table(11,AT_TW11:DT_TW11)=7;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE6*PE_TW11)+(TRANSIT_DISTANCE(7,x
_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(7,x_decimal(1,21)+1)*PKC
H_TW11);


elseif S(1,41)==0 && S(1,42)==1 && S(1,43)==1 && S(1,44)==1

   validity_table(11,AT_TW11:DT_TW11)=8;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE7*PE_TW11)+(TRANSIT_DISTANCE(8,x
_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(8,x_decimal(1,21)+1)*PKC
H_TW11);


elseif S(1,41)==1 && S(1,42)==0 && S(1,43)==0 && S(1,44)==0

   validity_table(11,AT_TW11:DT_TW11)=9;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE8*PE_TW11)+(TRANSIT_DISTANCE(9,x
_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(9,x_decimal(1,21)+1)*PKC
H_TW11);

elseif S(1,41)==1 && S(1,42)==0 && S(1,43)==0 && S(1,44)==1

   validity_table(11,AT_TW11:DT_TW11)=10;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE9*PE_TW11)+(TRANSIT_DISTANCE(10,
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```
x_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(10,x_decimal(1,21)+1)*P
KCH_TW11);

elseif S(1,41)==1 && S(1,42)==0 && S(1,43)==1 && S(1,44)==0

   validity_table(11,AT_TW11:DT_TW11)=11;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE10*PE_TW11)+(TRANSIT_DISTANCE(11
,x_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(11,x_decimal(1,21)+1)*P
KCH_TW11);

elseif S(1,41)==1 && S(1,42)==0 && S(1,43)==1 && S(1,44)==1

   validity_table(11,AT_TW11:DT_TW11)=12;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE11*PE_TW11)+(TRANSIT_DISTANCE(12
,x_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(12,x_decimal(1,21)+1)*P
KCH_TW11);


elseif S(1,41)==1 && S(1,42)==1 && S(1,43)==0 && S(1,44)==0

   validity_table(11,AT_TW11:DT_TW11)=13;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE12*PE_TW11)+(TRANSIT_DISTANCE(13
,x_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(13,x_decimal(1,21)+1)*P
KCH_TW11);

elseif S(1,41)==1 && S(1,42)==1 && S(1,43)==0 && S(1,44)==1

   validity_table(11,AT_TW11:DT_TW11)=14;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE13*PE_TW11)+(TRANSIT_DISTANCE(14
,x_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(14,x_decimal(1,21)+1)*P
KCH_TW11);

elseif S(1,41)==1 && S(1,42)==1 && S(1,43)==1 && S(1,44)==0

   validity_table(11,AT_TW11:DT_TW11)=15;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE14*PE_TW11)+(TRANSIT_DISTANCE(15
,x_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(15,x_decimal(1,21)+1)*P
KCH_TW11);

elseif S(1,41)==1 && S(1,42)==1 && S(1,43)==1 && S(1,44)==1

   validity_table(11,AT_TW11:DT_TW11)=16;
   TO-
TAL_DISTANCE11=(GATE_DISTANCE15*PE_TW11)+(TRANSIT_DISTANCE(16
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```
,x_decimal(1,1)+1)*PPEN_TW11)+(TRANSIT_DISTANCE(16,x_decimal(1,21)+1)*P
KCH_TW11);


end


%----------------timewindow12--------------------

if S(1,45)==0 && S(1,46)==0 && S(1,47)==0 && S(1,48)==0

   validity_table(12,AT_TW12:DT_TW12)=1;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE0*PE_TW12)+(TRANSIT_DISTANCE(1,x
_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(1,x_decimal(1,21)+1)*PKC
H_TW12);

elseif S(1,45)==0 && S(1,46)==0 && S(1,47)==0 && S(1,48)==1

   validity_table(12,AT_TW12:DT_TW12)=2;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE1*PE_TW12)+(TRANSIT_DISTANCE(2,x
_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(2,x_decimal(1,21)+1)*PKC
H_TW12);

elseif S(1,45)==0 && S(1,46)==0 && S(1,47)==1 && S(1,48)==0

   validity_table(12,AT_TW12:DT_TW12)=3;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE2*PE_TW12)+(TRANSIT_DISTANCE(3,x
_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(3,x_decimal(1,21)+1)*PKC
H_TW12);

elseif S(1,45)==0 && S(1,46)==0 && S(1,47)==1 && S(1,48)==1

   validity_table(12,AT_TW12:DT_TW12)=4;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE3*PE_TW12)+(TRANSIT_DISTANCE(4,x
_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(4,x_decimal(1,21)+1)*PKC
H_TW12);

elseif S(1,45)==0 && S(1,46)==1 && S(1,47)==0 && S(1,48)==0

   validity_table(12,AT_TW12:DT_TW12)=5;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE4*PE_TW12)+(TRANSIT_DISTANCE(5,x
_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(5,x_decimal(1,21)+1)*PKC
H_TW12);
```

```
elseif S(1,45)==0 && S(1,46)==1 && S(1,47)==0 && S(1,48)==1

   validity_table(12,AT_TW12:DT_TW12)=6;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE5*PE_TW12)+(TRANSIT_DISTANCE(6,x
_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(6,x_decimal(1,21)+1)*PKC
H_TW12);

elseif S(1,45)==0 && S(1,46)==1 && S(1,47)==1 && S(1,48)==0

   validity_table(12,AT_TW12:DT_TW12)=7;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE6*PE_TW12)+(TRANSIT_DISTANCE(7,x
_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(7,x_decimal(1,21)+1)*PKC
H_TW12);

elseif S(1,45)==0 && S(1,46)==1 && S(1,47)==1 && S(1,48)==1

   validity_table(12,AT_TW12:DT_TW12)=8;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE7*PE_TW12)+(TRANSIT_DISTANCE(8,x
_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(8,x_decimal(1,21)+1)*PKC
H_TW12);

elseif S(1,45)==1 && S(1,46)==0 && S(1,47)==0 && S(1,48)==0

   validity_table(12,AT_TW12:DT_TW12)=9;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE8*PE_TW12)+(TRANSIT_DISTANCE(9,x
_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(9,x_decimal(1,21)+1)*PKC
H_TW12);

elseif S(1,45)==1 && S(1,46)==0 && S(1,47)==0 && S(1,48)==1

   validity_table(12,AT_TW12:DT_TW12)=10;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE9*PE_TW12)+(TRANSIT_DISTANCE(10,
x_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(10,x_decimal(1,21)+1)*P
KCH_TW12);

elseif S(1,45)==1 && S(1,46)==0 && S(1,47)==1 && S(1,48)==0

   validity_table(12,AT_TW12:DT_TW12)=11;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE10*PE_TW12)+(TRANSIT_DISTANCE(11
,x_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(11,x_decimal(1,21)+1)*P
KCH_TW12);

elseif S(1,45)==1 && S(1,46)==0 && S(1,47)==1 && S(1,48)==1
```

```
   validity_table(12,AT_TW12:DT_TW12)=12;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE11*PE_TW12)+(TRANSIT_DISTANCE(12
,x_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(12,x_decimal(1,21)+1)*P
KCH_TW12);

elseif S(1,45)==1 && S(1,46)==1 && S(1,47)==0 && S(1,48)==0

   validity_table(12,AT_TW12:DT_TW12)=13;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE12*PE_TW12)+(TRANSIT_DISTANCE(13
,x_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(13,x_decimal(1,21)+1)*P
KCH_TW12);

elseif S(1,45)==1 && S(1,46)==1 && S(1,47)==0 && S(1,48)==1

   validity_table(12,AT_TW12:DT_TW12)=14;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE13*PE_TW12)+(TRANSIT_DISTANCE(14
,x_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(14,x_decimal(1,21)+1)*P
KCH_TW12);

elseif S(1,45)==1 && S(1,46)==1 && S(1,47)==1 && S(1,48)==0

   validity_table(12,AT_TW12:DT_TW12)=15;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE14*PE_TW12)+(TRANSIT_DISTANCE(15
,x_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(15,x_decimal(1,21)+1)*P
KCH_TW12);

elseif S(1,45)==1 && S(1,46)==1 && S(1,47)==1 && S(1,48)==1

   validity_table(12,AT_TW12:DT_TW12)=16;
   TO-
TAL_DISTANCE12=(GATE_DISTANCE15*PE_TW12)+(TRANSIT_DISTANCE(16
,x_decimal(1,2)+1)*PPEN_TW12)+(TRANSIT_DISTANCE(16,x_decimal(1,21)+1)*P
KCH_TW12);

end


%----------------timewindoW13-----------------------------------------


if S(1,49)==0 && S(1,50)==0 && S(1,51)==0 && S(1,52)==0

   validity_table(13,AT_TW13:DT_TW13)=1;
```

```
    TO-
TAL_DISTANCE13=(GATE_DISTANCE0*PE_TW13)+(TRANSIT_DISTANCE(1,x
_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(1,x_decimal(1,22)+1)*PKC
H_TW13);

elseif S(1,49)==0 && S(1,50)==0 && S(1,51)==0 && S(1,52)==1

    validity_table(13,AT_TW13:DT_TW13)=2;
    TO-
TAL_DISTANCE13=(GATE_DISTANCE1*PE_TW13)+(TRANSIT_DISTANCE(2,x
_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(2,x_decimal(1,22)+1)*PKC
H_TW13);

elseif S(1,49)==0 && S(1,50)==0 && S(1,51)==1 && S(1,52)==0

    validity_table(13,AT_TW13:DT_TW13)=3;
    TO-
TAL_DISTANCE13=(GATE_DISTANCE2*PE_TW13)+(TRANSIT_DISTANCE(3,x
_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(3,x_decimal(1,22)+1)*PKC
H_TW13);

elseif S(1,49)==0 && S(1,50)==0 && S(1,51)==1 && S(1,52)==1

    validity_table(13,AT_TW13:DT_TW13)=4;
    TO-
TAL_DISTANCE13=(GATE_DISTANCE3*PE_TW13)+(TRANSIT_DISTANCE(4,x
_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(4,x_decimal(1,22)+1)*PKC
H_TW13);

elseif S(1,49)==0 && S(1,50)==1 && S(1,51)==0 && S(1,52)==0

    validity_table(13,AT_TW13:DT_TW13)=5;
    TO-
TAL_DISTANCE13=(GATE_DISTANCE4*PE_TW13)+(TRANSIT_DISTANCE(5,x
_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(5,x_decimal(1,22)+1)*PKC
H_TW13);

elseif S(1,49)==0 && S(1,50)==1 && S(1,51)==0 && S(1,52)==1

    validity_table(13,AT_TW13:DT_TW13)=6;
   TO-
TAL_DISTANCE13=(GATE_DISTANCE5*PE_TW13)+(TRANSIT_DISTANCE(6,x
_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(6,x_decimal(1,22)+1)*PKC
H_TW13);

elseif S(1,49)==0 && S(1,50)==1 && S(1,51)==1 && S(1,52)==0

    validity_table(13,AT_TW13:DT_TW13)=7;
```

```
   TO-
TAL_DISTANCE13=(GATE_DISTANCE6*PE_TW13)+(TRANSIT_DISTANCE(7,x
_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(7,x_decimal(1,22)+1)*PKC
H_TW13);

elseif S(1,49)==0 && S(1,50)==1 && S(1,51)==1 && S(1,52)==1

   validity_table(13,AT_TW13:DT_TW13)=8;
   TO-
TAL_DISTANCE13=(GATE_DISTANCE7*PE_TW13)+(TRANSIT_DISTANCE(8,x
_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(8,x_decimal(1,22)+1)*PKC
H_TW13);

elseif S(1,49)==1 && S(1,50)==0 && S(1,51)==0 && S(1,52)==0

   validity_table(13,AT_TW13:DT_TW13)=9;
   TO-
TAL_DISTANCE13=(GATE_DISTANCE8*PE_TW13)+(TRANSIT_DISTANCE(9,x
_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(9,x_decimal(1,22)+1)*PKC
H_TW13);


elseif S(1,49)==1 && S(1,50)==0 && S(1,51)==0 && S(1,52)==1

   validity_table(13,AT_TW13:DT_TW13)=10;
   TO-
TAL_DISTANCE13=(GATE_DISTANCE9*PE_TW13)+(TRANSIT_DISTANCE(10,
x_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(10,x_decimal(1,22)+1)*P
KCH_TW13);

elseif S(1,49)==1 && S(1,50)==0 && S(1,51)==1 && S(1,52)==0

   validity_table(13,AT_TW13:DT_TW13)=11;
   TO-
TAL_DISTANCE13=(GATE_DISTANCE10*PE_TW13)+(TRANSIT_DISTANCE(11
,x_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(11,x_decimal(1,22)+1)*P
KCH_TW13);


elseif S(1,49)==1 && S(1,50)==0 && S(1,51)==1 && S(1,52)==1

   validity_table(13,AT_TW13:DT_TW13)=12;
   TO-
TAL_DISTANCE13=(GATE_DISTANCE11*PE_TW13)+(TRANSIT_DISTANCE(12
,x_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(12,x_decimal(1,22)+1)*P
KCH_TW13);


elseif S(1,49)==1 && S(1,50)==1 && S(1,51)==0 && S(1,52)==0
```

```
   validity_table(13,AT_TW13:DT_TW13)=13;
   TO-
TAL_DISTANCE13=(GATE_DISTANCE12*PE_TW13)+(TRANSIT_DISTANCE(13
,x_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(13,x_decimal(1,22)+1)*P
KCH_TW13);


elseif S(1,49)==1 && S(1,50)==1 && S(1,51)==0 && S(1,52)==1

   validity_table(13,AT_TW13:DT_TW13)=14;
   TO-
TAL_DISTANCE13=(GATE_DISTANCE13*PE_TW13)+(TRANSIT_DISTANCE(14
,x_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(14,x_decimal(1,22)+1)*P
KCH_TW13);

elseif S(1,49)==1 && S(1,50)==1 && S(1,51)==1 && S(1,52)==0

   validity_table(13,AT_TW13:DT_TW13)=15;
   TO-
TAL_DISTANCE13=(GATE_DISTANCE14*PE_TW13)+(TRANSIT_DISTANCE(15
,x_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(15,x_decimal(1,22)+1)*P
KCH_TW13);


elseif S(1,49)==1 && S(1,50)==1 && S(1,51)==1 && S(1,52)==1

   validity_table(13,AT_TW13:DT_TW13)=16;
   TO-
TAL_DISTANCE13=(GATE_DISTANCE15*PE_TW13)+(TRANSIT_DISTANCE(16
,x_decimal(1,3)+1)*PPEN_TW13)+(TRANSIT_DISTANCE(16,x_decimal(1,22)+1)*P
KCH_TW13);

end


%----------------timewindoW14--------------------

if S(1,53)==0 && S(1,54)==0 && S(1,55)==0 && S(1,56)==0

   validity_table(14,AT_TW14:DT_TW14)=1;
   TO-
TAL_DISTANCE14=(GATE_DISTANCE0*PE_TW14)+(TRANSIT_DISTANCE(1,x
_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(1,x_decimal(1,24)+1)*PKC
H_TW14);

elseif S(1,53)==0 && S(1,54)==0 && S(1,55)==0 && S(1,56)==1

   validity_table(14,AT_TW14:DT_TW14)=2;
```

```
    TO-
TAL_DISTANCE14=(GATE_DISTANCE1*PE_TW14)+(TRANSIT_DISTANCE(2,x
_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(2,x_decimal(1,24)+1)*PKC
H_TW14);

elseif S(1,53)==0 && S(1,54)==0 && S(1,55)==1 && S(1,56)==0

    validity_table(14,AT_TW14:DT_TW14)=3;
    TO-
TAL_DISTANCE14=(GATE_DISTANCE2*PE_TW14)+(TRANSIT_DISTANCE(3,x
_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(3,x_decimal(1,24)+1)*PKC
H_TW14);

elseif S(1,53)==0 && S(1,54)==0 && S(1,55)==1 && S(1,56)==1

    validity_table(14,AT_TW14:DT_TW14)=4;
    TO-
TAL_DISTANCE14=(GATE_DISTANCE3*PE_TW14)+(TRANSIT_DISTANCE(4,x
_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(4,x_decimal(1,24)+1)*PKC
H_TW14);

elseif S(1,53)==0 && S(1,54)==1 && S(1,55)==0 && S(1,56)==0

    validity_table(14,AT_TW14:DT_TW14)=5;
    TO-
TAL_DISTANCE14=(GATE_DISTANCE4*PE_TW14)+(TRANSIT_DISTANCE(5,x
_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(5,x_decimal(1,24)+1)*PKC
H_TW14);

elseif S(1,53)==0 && S(1,54)==1 && S(1,55)==0 && S(1,56)==1

    validity_table(14,AT_TW14:DT_TW14)=6;
    TO-
TAL_DISTANCE14=(GATE_DISTANCE5*PE_TW14)+(TRANSIT_DISTANCE(6,x
_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(6,x_decimal(1,24)+1)*PKC
H_TW14);

elseif S(1,53)==0 && S(1,54)==1 && S(1,55)==1 && S(1,56)==0

    validity_table(14,AT_TW14:DT_TW14)=7;
    TO-
TAL_DISTANCE14=(GATE_DISTANCE6*PE_TW14)+(TRANSIT_DISTANCE(7,x
_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(7,x_decimal(1,24)+1)*PKC
H_TW14);

elseif S(1,53)==0 && S(1,54)==1 && S(1,55)==1 && S(1,56)==1

    validity_table(14,AT_TW14:DT_TW14)=8;
```

```
    TO-
TAL_DISTANCE14=(GATE_DISTANCE7*PE_TW14)+(TRANSIT_DISTANCE(8,x
_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(8,x_decimal(1,24)+1)*PKC
H_TW14);

elseif S(1,53)==1 && S(1,54)==0 && S(1,55)==0 && S(1,56)==0

    validity_table(14,AT_TW14:DT_TW14)=9;
    TO-
TAL_DISTANCE14=(GATE_DISTANCE8*PE_TW14)+(TRANSIT_DISTANCE(9,x
_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(9,x_decimal(1,24)+1)*PKC
H_TW14);


elseif S(1,53)==1 && S(1,54)==0 && S(1,55)==0 && S(1,56)==1

    validity_table(14,AT_TW14:DT_TW14)=10;
    TO-
TAL_DISTANCE14=(GATE_DISTANCE9*PE_TW14)+(TRANSIT_DISTANCE(10,
x_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(10,x_decimal(1,24)+1)*P
KCH_TW14);


elseif S(1,53)==1 && S(1,54)==0 && S(1,55)==1 && S(1,56)==0

    validity_table(14,AT_TW14:DT_TW14)=11;
    TO-
TAL_DISTANCE14=(GATE_DISTANCE10*PE_TW14)+(TRANSIT_DISTANCE(11
,x_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(11,x_decimal(1,24)+1)*P
KCH_TW14);

elseif S(1,53)==1 && S(1,54)==0 && S(1,55)==1 && S(1,56)==1

    validity_table(14,AT_TW14:DT_TW14)=12;
    TO-
TAL_DISTANCE14=(GATE_DISTANCE11*PE_TW14)+(TRANSIT_DISTANCE(12
,x_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(12,x_decimal(1,24)+1)*P
KCH_TW14);

elseif S(1,53)==1 && S(1,54)==1 && S(1,55)==0 && S(1,56)==0

    validity_table(14,AT_TW14:DT_TW14)=13;
    TO-
TAL_DISTANCE14=(GATE_DISTANCE12*PE_TW14)+(TRANSIT_DISTANCE(13
,x_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(13,x_decimal(1,24)+1)*P
KCH_TW14);

elseif S(1,53)==1 && S(1,54)==1 && S(1,55)==0 && S(1,56)==1
```

```
   validity_table(14,AT_TW14:DT_TW14)=14;
   TO-
TAL_DISTANCE14=(GATE_DISTANCE13*PE_TW14)+(TRANSIT_DISTANCE(14
,x_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(14,x_decimal(1,24)+1)*P
KCH_TW14);

elseif S(1,53)==1 && S(1,54)==1 && S(1,55)==1 && S(1,56)==0

   validity_table(14,AT_TW14:DT_TW14)=15;
   TO-
TAL_DISTANCE14=(GATE_DISTANCE14*PE_TW14)+(TRANSIT_DISTANCE(15
,x_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(15,x_decimal(1,24)+1)*P
KCH_TW14);

elseif S(1,53)==1 && S(1,54)==1 && S(1,55)==1 && S(1,56)==1

   validity_table(14,AT_TW14:DT_TW14)=16;
   TO-
TAL_DISTANCE14=(GATE_DISTANCE15*PE_TW14)+(TRANSIT_DISTANCE(16
,x_decimal(1,4)+1)*PPEN_TW14)+(TRANSIT_DISTANCE(16,x_decimal(1,24)+1)*P
KCH_TW14);


end


%----------------timewindow15--------------------

if S(1,57)==0 && S(1,58)==0 && S(1,59)==0 && S(1,60)==0

   validity_table(15,AT_TW15:DT_TW15)=1;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE0*PE_TW15)+(TRANSIT_DISTANCE(1,x
_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(1,x_decimal(1,26)+1)*PKC
H_TW15);

elseif S(1,57)==0 && S(1,58)==0 && S(1,59)==0 && S(1,60)==1

   validity_table(15,AT_TW15:DT_TW15)=2;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE1*PE_TW15)+(TRANSIT_DISTANCE(2,x
_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(2,x_decimal(1,26)+1)*PKC
H_TW15);

elseif S(1,57)==0 && S(1,58)==0 && S(1,59)==1 && S(1,60)==0

   validity_table(15,AT_TW15:DT_TW15)=3;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE2*PE_TW15)+(TRANSIT_DISTANCE(3,x
```

```
_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(3,x_decimal(1,26)+1)*PKC
H_TW15);

elseif S(1,57)==0 && S(1,58)==0 && S(1,59)==1 && S(1,60)==1

   validity_table(15,AT_TW15:DT_TW15)=4;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE3*PE_TW15)+(TRANSIT_DISTANCE(4,x
_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(4,x_decimal(1,26)+1)*PKC
H_TW15);

elseif S(1,57)==0 && S(1,58)==1 && S(1,59)==0 && S(1,60)==0

   validity_table(15,AT_TW15:DT_TW15)=5;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE4*PE_TW15)+(TRANSIT_DISTANCE(5,x
_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(5,x_decimal(1,26)+1)*PKC
H_TW15);

elseif S(1,57)==0 && S(1,58)==1 && S(1,59)==0 && S(1,60)==1

   validity_table(15,AT_TW15:DT_TW15)=6;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE5*PE_TW15)+(TRANSIT_DISTANCE(6,x
_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(6,x_decimal(1,26)+1)*PKC
H_TW15);

elseif S(1,57)==0 && S(1,58)==1 && S(1,59)==1 && S(1,60)==0

   validity_table(15,AT_TW15:DT_TW15)=7;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE6*PE_TW15)+(TRANSIT_DISTANCE(7,x
_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(7,x_decimal(1,26)+1)*PKC
H_TW15);

elseif S(1,57)==0 && S(1,58)==1 && S(1,59)==1 && S(1,60)==1

   validity_table(15,AT_TW15:DT_TW15)=8;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE7*PE_TW15)+(TRANSIT_DISTANCE(8,x
_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(8,x_decimal(1,26)+1)*PKC
H_TW15);


elseif S(1,57)==1 && S(1,58)==0 && S(1,59)==0 && S(1,60)==0

   validity_table(15,AT_TW15:DT_TW15)=9;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE8*PE_TW15)+(TRANSIT_DISTANCE(9,x
```

```
_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(9,x_decimal(1,26)+1)*PKC
H_TW15);

elseif S(1,57)==1 && S(1,58)==0 && S(1,59)==0 && S(1,60)==1

   validity_table(15,AT_TW15:DT_TW15)=10;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE9*PE_TW15)+(TRANSIT_DISTANCE(10,
x_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(10,x_decimal(1,26)+1)*P
KCH_TW15);

elseif S(1,57)==1 && S(1,58)==0 && S(1,59)==1 && S(1,60)==0

   validity_table(15,AT_TW15:DT_TW15)=11;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE10*PE_TW15)+(TRANSIT_DISTANCE(11
,x_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(11,x_decimal(1,26)+1)*P
KCH_TW15);

elseif S(1,57)==1 && S(1,58)==0 && S(1,59)==1 && S(1,60)==1

   validity_table(15,AT_TW15:DT_TW15)=12;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE11*PE_TW15)+(TRANSIT_DISTANCE(12
,x_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(12,x_decimal(1,26)+1)*P
KCH_TW15);

elseif S(1,57)==1 && S(1,58)==1 && S(1,59)==0 && S(1,60)==0

   validity_table(15,AT_TW15:DT_TW15)=13;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE12*PE_TW15)+(TRANSIT_DISTANCE(13
,x_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(13,x_decimal(1,26)+1)*P
KCH_TW15);

elseif S(1,57)==1 && S(1,58)==1 && S(1,59)==0 && S(1,60)==1

   validity_table(15,AT_TW15:DT_TW15)=14;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE13*PE_TW15)+(TRANSIT_DISTANCE(14
,x_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(14,x_decimal(1,26)+1)*P
KCH_TW15);

elseif S(1,57)==1 && S(1,58)==1 && S(1,59)==1 && S(1,60)==0

   validity_table(15,AT_TW15:DT_TW15)=15;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE14*PE_TW15)+(TRANSIT_DISTANCE(15
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```
,x_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(15,x_decimal(1,26)+1)*P
KCH_TW15);

elseif S(1,57)==1 && S(1,58)==1 && S(1,59)==1 && S(1,60)==1

   validity_table(15,AT_TW15:DT_TW15)=16;
   TO-
TAL_DISTANCE15=(GATE_DISTANCE15*PE_TW15)+(TRANSIT_DISTANCE(16
,x_decimal(1,6)+1)*PPEN_TW15)+(TRANSIT_DISTANCE(16,x_decimal(1,26)+1)*P
KCH_TW15);


end


%----------------timewindow16 -------------------

if S(1,61)==0 && S(1,62)==0 && S(1,63)==0 && S(1,64)==0

   validity_table(16,AT_TW16:DT_TW16)=1;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE0*PE_TW16)+(TRANSIT_DISTANCE(1,x
_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(1,x_decimal(1,27)+1)*PKC
H_TW16);

elseif S(1,61)==0 && S(1,62)==0 && S(1,63)==0 && S(1,64)==1

   validity_table(16,AT_TW16:DT_TW16)=2;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE1*PE_TW16)+(TRANSIT_DISTANCE(2,x
_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(2,x_decimal(1,27)+1)*PKC
H_TW16);

elseif S(1,61)==0 && S(1,62)==0 && S(1,63)==1 && S(1,64)==0

   validity_table(16,AT_TW16:DT_TW16)=3;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE2*PE_TW16)+(TRANSIT_DISTANCE(3,x
_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(3,x_decimal(1,27)+1)*PKC
H_TW16);

elseif S(1,61)==0 && S(1,62)==0 && S(1,63)==1 && S(1,64)==1

   validity_table(16,AT_TW16:DT_TW16)=4;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE3*PE_TW16)+(TRANSIT_DISTANCE(4,x
_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(4,x_decimal(1,27)+1)*PKC
H_TW16);
```

```
elseif S(1,61)==0 && S(1,62)==1 && S(1,63)==0 && S(1,64)==0

   validity_table(16,AT_TW16:DT_TW16)=5;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE4*PE_TW16)+(TRANSIT_DISTANCE(5,x
_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(5,x_decimal(1,27)+1)*PKC
H_TW16);

elseif S(1,61)==0 && S(1,62)==1 && S(1,63)==0 && S(1,64)==1

   validity_table(16,AT_TW16:DT_TW16)=6;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE5*PE_TW16)+(TRANSIT_DISTANCE(6,x
_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(6,x_decimal(1,27)+1)*PKC
H_TW16);

elseif S(1,61)==0 && S(1,62)==1 && S(1,63)==1 && S(1,64)==0

   validity_table(16,AT_TW16:DT_TW16)=7;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE6*PE_TW16)+(TRANSIT_DISTANCE(7,x
_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(7,x_decimal(1,27)+1)*PKC
H_TW16);


elseif S(1,61)==0 && S(1,62)==1 && S(1,63)==1 && S(1,64)==1

   validity_table(16,AT_TW16:DT_TW16)=8;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE7*PE_TW16)+(TRANSIT_DISTANCE(8,x
_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(8,x_decimal(1,27)+1)*PKC
H_TW16);

elseif S(1,61)==1 && S(1,62)==0 && S(1,63)==0 && S(1,64)==0

   validity_table(16,AT_TW16:DT_TW16)=9;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE8*PE_TW16)+(TRANSIT_DISTANCE(9,x
_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(9,x_decimal(1,27)+1)*PKC
H_TW16);

elseif S(1,61)==1 && S(1,62)==0 && S(1,63)==0 && S(1,64)==1

   validity_table(16,AT_TW16:DT_TW16)=10;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE9*PE_TW16)+(TRANSIT_DISTANCE(10,
x_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(10,x_decimal(1,27)+1)*P
KCH_TW16);
```

```
elseif S(1,61)==1 && S(1,62)==0 && S(1,63)==1 && S(1,64)==0

   validity_table(16,AT_TW16:DT_TW16)=11;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE10*PE_TW16)+(TRANSIT_DISTANCE(11
,x_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(11,x_decimal(1,27)+1)*P
KCH_TW16);

elseif S(1,61)==1 && S(1,62)==0 && S(1,63)==1 && S(1,64)==1

   validity_table(16,AT_TW16:DT_TW16)=12;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE11*PE_TW16)+(TRANSIT_DISTANCE(12
,x_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(12,x_decimal(1,27)+1)*P
KCH_TW16);

elseif S(1,61)==1 && S(1,62)==1 && S(1,63)==0 && S(1,64)==0

   validity_table(16,AT_TW16:DT_TW16)=13;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE12*PE_TW16)+(TRANSIT_DISTANCE(13
,x_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(13,x_decimal(1,27)+1)*P
KCH_TW16);

elseif S(1,61)==1 && S(1,62)==1 && S(1,63)==0 && S(1,64)==1

   validity_table(16,AT_TW16:DT_TW16)=14;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE13*PE_TW16)+(TRANSIT_DISTANCE(14
,x_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(14,x_decimal(1,27)+1)*P
KCH_TW16);

elseif S(1,61)==1 && S(1,62)==1 && S(1,63)==1 && S(1,64)==0

   validity_table(16,AT_TW16:DT_TW16)=15;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE14*PE_TW16)+(TRANSIT_DISTANCE(15
,x_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(15,x_decimal(1,27)+1)*P
KCH_TW16);

elseif S(1,61)==1 && S(1,62)==1 && S(1,63)==1 && S(1,64)==1

   validity_table(16,AT_TW16:DT_TW16)=16;
   TO-
TAL_DISTANCE16=(GATE_DISTANCE15*PE_TW16)+(TRANSIT_DISTANCE(16
,x_decimal(1,8)+1)*PPEN_TW16)+(TRANSIT_DISTANCE(16,x_decimal(1,27)+1)*P
KCH_TW16);
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```
end

%----------------timewindow17 (LAST FLIGHT)--------------------

if S(1,65)==0 && S(1,66)==0 && S(1,67)==0 && S(1,68)==0

   validity_table(17,AT_TW17:DT_TW17)=1;
   TOTAL_DISTANCE17=(GATE_DISTANCE0*PE_TW17);

elseif S(1,65)==0 && S(1,66)==0 && S(1,67)==0 && S(1,68)==1

   validity_table(17,AT_TW17:DT_TW17)=2;
   TOTAL_DISTANCE17=(GATE_DISTANCE1*PE_TW17);

elseif S(1,65)==0 && S(1,66)==0 && S(1,67)==1 && S(1,68)==0

   validity_table(17,AT_TW17:DT_TW17)=3;
   TOTAL_DISTANCE17=(GATE_DISTANCE2*PE_TW17);

elseif S(1,65)==0 && S(1,66)==0 && S(1,67)==1 && S(1,68)==1

   validity_table(17,AT_TW17:DT_TW17)=4;
   TOTAL_DISTANCE17=(GATE_DISTANCE3*PE_TW17);

elseif S(1,65)==0 && S(1,66)==1 && S(1,67)==0 && S(1,68)==0

   validity_table(17,AT_TW17:DT_TW17)=5;
   TOTAL_DISTANCE17=(GATE_DISTANCE4*PE_TW17);

elseif S(1,65)==0 && S(1,66)==1 && S(1,67)==0 && S(1,68)==1

   validity_table(17,AT_TW17:DT_TW17)=6;
   TOTAL_DISTANCE17=(GATE_DISTANCE5*PE_TW17);


elseif S(1,65)==0 && S(1,66)==1 && S(1,67)==1 && S(1,68)==0

   validity_table(17,AT_TW17:DT_TW17)=7;
   TOTAL_DISTANCE17=(GATE_DISTANCE6*PE_TW17);

elseif S(1,65)==0 && S(1,66)==1 && S(1,67)==1 && S(1,68)==1

   validity_table(17,AT_TW17:DT_TW17)=8;
   TOTAL_DISTANCE17=(GATE_DISTANCE7*PE_TW17);

elseif S(1,65)==1 && S(1,66)==0 && S(1,67)==0 && S(1,68)==0

   validity_table(17,AT_TW17:DT_TW17)=9;
```

```
    TOTAL_DISTANCE17=(GATE_DISTANCE8*PE_TW17);

elseif S(1,65)==1 && S(1,66)==0 && S(1,67)==0 && S(1,68)==1

    validity_table(17,AT_TW17:DT_TW17)=10;
    TOTAL_DISTANCE17=(GATE_DISTANCE9*PE_TW17);

elseif S(1,65)==1 && S(1,66)==0 && S(1,67)==1 && S(1,68)==0

    validity_table(17,AT_TW17:DT_TW17)=11;
    TOTAL_DISTANCE17=(GATE_DISTANCE10*PE_TW17);

elseif S(1,65)==1 && S(1,66)==0 && S(1,67)==1 && S(1,68)==1

    validity_table(17,AT_TW17:DT_TW17)=12;
    TOTAL_DISTANCE17=(GATE_DISTANCE11*PE_TW17);

elseif S(1,65)==1 && S(1,66)==1 && S(1,67)==0 && S(1,68)==0

    validity_table(17,AT_TW17:DT_TW17)=13;
    TOTAL_DISTANCE17=(GATE_DISTANCE12*PE_TW17);

elseif S(1,65)==1 && S(1,66)==1 && S(1,67)==0 && S(1,68)==1

    validity_table(17,AT_TW17:DT_TW17)=14;
    TOTAL_DISTANCE17=(GATE_DISTANCE13*PE_TW17);

elseif S(1,65)==1 && S(1,66)==1 && S(1,67)==1 && S(1,68)==0

    validity_table(17,AT_TW17:DT_TW17)=15;
    TOTAL_DISTANCE17=(GATE_DISTANCE14*PE_TW17);

elseif S(1,65)==1 && S(1,66)==1 && S(1,67)==1 && S(1,68)==1

    validity_table(17,AT_TW17:DT_TW17)=16;
    TOTAL_DISTANCE17=(GATE_DISTANCE15*PE_TW17);

end


%----------------timewindow18 (LAST FLIGHT)--------------------

if S(1,69)==0 && S(1,70)==0 && S(1,71)==0 && S(1,72)==0

    validity_table(18,AT_TW18:DT_TW18)=1;
    TOTAL_DISTANCE18=(GATE_DISTANCE0*PE_TW18);


elseif S(1,69)==0 && S(1,70)==0 && S(1,71)==0 && S(1,72)==1
```

```
    validity_table(18,AT_TW18:DT_TW18)=2;
    TOTAL_DISTANCE18=(GATE_DISTANCE1*PE_TW18);


elseif S(1,69)==0 && S(1,70)==0 && S(1,71)==1 && S(1,72)==0

    validity_table(18,AT_TW18:DT_TW18)=3;
    TOTAL_DISTANCE18=(GATE_DISTANCE2*PE_TW18);


elseif S(1,69)==0 && S(1,70)==0 && S(1,71)==1 && S(1,72)==1

    validity_table(18,AT_TW18:DT_TW18)=4;
    TOTAL_DISTANCE18=(GATE_DISTANCE3*PE_TW18);


elseif S(1,69)==0 && S(1,70)==1 && S(1,71)==0 && S(1,72)==0

    validity_table(18,AT_TW18:DT_TW18)=5;
    TOTAL_DISTANCE18=(GATE_DISTANCE4*PE_TW18);


elseif S(1,69)==0 && S(1,70)==1 && S(1,71)==0 && S(1,72)==1

    validity_table(18,AT_TW18:DT_TW18)=6;
    TOTAL_DISTANCE18=(GATE_DISTANCE5*PE_TW18);


elseif S(1,69)==0 && S(1,70)==1 && S(1,71)==1 && S(1,72)==0

    validity_table(18,AT_TW18:DT_TW18)=7;
    TOTAL_DISTANCE18=(GATE_DISTANCE6*PE_TW18);


elseif S(1,69)==0 && S(1,70)==1 && S(1,71)==1 && S(1,72)==1

    validity_table(18,AT_TW18:DT_TW18)=8;
    TOTAL_DISTANCE18=(GATE_DISTANCE7*PE_TW18);


elseif S(1,69)==1 && S(1,70)==0 && S(1,71)==0 && S(1,72)==0

    validity_table(18,AT_TW18:DT_TW18)=9;
    TOTAL_DISTANCE18=(GATE_DISTANCE8*PE_TW18);

elseif S(1,69)==1 && S(1,70)==0 && S(1,71)==0 && S(1,72)==1

    validity_table(18,AT_TW18:DT_TW18)=10;
```

```
    TOTAL_DISTANCE18=(GATE_DISTANCE9*PE_TW18);


elseif S(1,69)==1 && S(1,70)==0 && S(1,71)==1 && S(1,72)==0

    validity_table(18,AT_TW18:DT_TW18)=11;
    TOTAL_DISTANCE18=(GATE_DISTANCE10*PE_TW18);

elseif S(1,69)==1 && S(1,70)==0 && S(1,71)==1 && S(1,72)==1

    validity_table(18,AT_TW18:DT_TW18)=12;
    TOTAL_DISTANCE18=(GATE_DISTANCE11*PE_TW18);

elseif S(1,69)==1 && S(1,70)==1 && S(1,71)==0 && S(1,72)==0

    validity_table(18,AT_TW18:DT_TW18)=13;
    TOTAL_DISTANCE18=(GATE_DISTANCE12*PE_TW18);

elseif S(1,69)==1 && S(1,70)==1 && S(1,71)==0 && S(1,72)==1

    validity_table(18,AT_TW18:DT_TW18)=14;
    TOTAL_DISTANCE18=(GATE_DISTANCE13*PE_TW18);

elseif S(1,69)==1 && S(1,70)==1 && S(1,71)==1 && S(1,72)==0

    validity_table(18,AT_TW18:DT_TW18)=15;
    TOTAL_DISTANCE18=(GATE_DISTANCE14*PE_TW18);

elseif S(1,69)==1 && S(1,70)==1 && S(1,71)==1 && S(1,72)==1

    validity_table(18,AT_TW18:DT_TW18)=16;
    TOTAL_DISTANCE18=(GATE_DISTANCE15*PE_TW18);

end


%----------------timewindow19 (LAST FLIGHT)--------------------

if S(1,73)==0 && S(1,74)==0 && S(1,75)==0 && S(1,76)==0

    validity_table(19,AT_TW19:DT_TW19)=1;
    TOTAL_DISTANCE19=(GATE_DISTANCE0*PE_TW19);

elseif S(1,73)==0 && S(1,74)==0 && S(1,75)==0 && S(1,76)==1

    validity_table(19,AT_TW19:DT_TW19)=2;
    TOTAL_DISTANCE19=(GATE_DISTANCE1*PE_TW19);

elseif S(1,73)==0 && S(1,74)==0 && S(1,75)==1 && S(1,76)==0
```

```
    validity_table(19,AT_TW19:DT_TW19)=3;
    TOTAL_DISTANCE19=(GATE_DISTANCE2*PE_TW19);

elseif S(1,73)==0 && S(1,74)==0 && S(1,75)==1 && S(1,76)==1

    validity_table(19,AT_TW19:DT_TW19)=4;
    TOTAL_DISTANCE19=(GATE_DISTANCE3*PE_TW19);

elseif S(1,73)==0 && S(1,74)==1 && S(1,75)==0 && S(1,76)==0

    validity_table(19,AT_TW19:DT_TW19)=5;
    TOTAL_DISTANCE19=(GATE_DISTANCE4*PE_TW19);

elseif S(1,73)==0 && S(1,74)==1 && S(1,75)==0 && S(1,76)==1

    validity_table(19,AT_TW19:DT_TW19)=6;
    TOTAL_DISTANCE19=(GATE_DISTANCE5*PE_TW19);

elseif S(1,73)==0 && S(1,74)==1 && S(1,75)==1 && S(1,76)==0

    validity_table(19,AT_TW19:DT_TW19)=7;
    TOTAL_DISTANCE19=(GATE_DISTANCE6*PE_TW19);

elseif S(1,73)==0 && S(1,74)==1 && S(1,75)==1 && S(1,76)==1

    validity_table(19,AT_TW19:DT_TW19)=8;
    TOTAL_DISTANCE19=(GATE_DISTANCE7*PE_TW19);

elseif S(1,73)==1 && S(1,74)==0 && S(1,75)==0 && S(1,76)==0

    validity_table(19,AT_TW19:DT_TW19)=9;
    TOTAL_DISTANCE19=(GATE_DISTANCE8*PE_TW19);

elseif S(1,73)==1 && S(1,74)==0 && S(1,75)==0 && S(1,76)==1

    validity_table(19,AT_TW19:DT_TW19)=10;
    TOTAL_DISTANCE19=(GATE_DISTANCE9*PE_TW19);

elseif S(1,73)==1 && S(1,74)==0 && S(1,75)==1 && S(1,76)==0

    validity_table(19,AT_TW19:DT_TW19)=11;
    TOTAL_DISTANCE19=(GATE_DISTANCE10*PE_TW19);

elseif S(1,73)==1 && S(1,74)==0 && S(1,75)==1 && S(1,76)==1

    validity_table(19,AT_TW19:DT_TW19)=12;
    TOTAL_DISTANCE19=(GATE_DISTANCE11*PE_TW19);
```

```
elseif S(1,73)==1 && S(1,74)==1 && S(1,75)==0 && S(1,76)==0

   validity_table(19,AT_TW19:DT_TW19)=13;
   TOTAL_DISTANCE19=(GATE_DISTANCE12*PE_TW19);

elseif S(1,73)==1 && S(1,74)==1 && S(1,75)==0 && S(1,76)==1

   validity_table(19,AT_TW19:DT_TW19)=14;
   TOTAL_DISTANCE19=(GATE_DISTANCE13*PE_TW19);

elseif S(1,73)==1 && S(1,74)==1 && S(1,75)==1 && S(1,76)==0

   validity_table(19,AT_TW19:DT_TW19)=15;
   TOTAL_DISTANCE19=(GATE_DISTANCE14*PE_TW19);

elseif S(1,73)==1 && S(1,74)==1 && S(1,75)==1 && S(1,76)==1

   validity_table(19,AT_TW19:DT_TW19)=16;
   TOTAL_DISTANCE19=(GATE_DISTANCE15*PE_TW19);

end



%----------------timewindow20 (LAST FLIGHT)--------------------

if S(1,77)==0 && S(1,78)==0 && S(1,79)==0 && S(1,80)==0

   validity_table(20,AT_TW20:DT_TW20)=1;
   TOTAL_DISTANCE20=(GATE_DISTANCE0*PE_TW20);

elseif S(1,77)==0 && S(1,78)==0 && S(1,79)==0 && S(1,80)==1

   validity_table(20,AT_TW20:DT_TW20)=2;
   TOTAL_DISTANCE20=(GATE_DISTANCE1*PE_TW20);

elseif S(1,77)==0 && S(1,78)==0 && S(1,79)==1 && S(1,80)==0
   validity_table(20,AT_TW20:DT_TW20)=3;
   TOTAL_DISTANCE20=(GATE_DISTANCE2*PE_TW20);

elseif S(1,77)==0 && S(1,78)==0 && S(1,79)==1 && S(1,80)==1
   validity_table(20,AT_TW20:DT_TW20)=4;
   TOTAL_DISTANCE20=(GATE_DISTANCE3*PE_TW20);

elseif S(1,77)==0 && S(1,78)==1 && S(1,79)==0 && S(1,80)==0
   validity_table(20,AT_TW20:DT_TW20)=5;
   TOTAL_DISTANCE20=(GATE_DISTANCE4*PE_TW20);

elseif S(1,77)==0 && S(1,78)==1 && S(1,79)==0 && S(1,80)==1
```

```
    validity_table(20,AT_TW20:DT_TW20)=6;
    TOTAL_DISTANCE20=(GATE_DISTANCE5*PE_TW20);

elseif S(1,77)==0 && S(1,78)==1 && S(1,79)==1 && S(1,80)==0

    validity_table(20,AT_TW20:DT_TW20)=7;
    TOTAL_DISTANCE20=(GATE_DISTANCE6*PE_TW20);

elseif S(1,77)==0 && S(1,78)==1 && S(1,79)==1 && S(1,80)==1

    validity_table(20,AT_TW20:DT_TW20)=8;
    TOTAL_DISTANCE20=(GATE_DISTANCE7*PE_TW20);

elseif S(1,77)==1 && S(1,78)==0 && S(1,79)==0 && S(1,80)==0

    validity_table(20,AT_TW20:DT_TW20)=9;
    TOTAL_DISTANCE20=(GATE_DISTANCE8*PE_TW20);

elseif S(1,77)==1 && S(1,78)==0 && S(1,79)==0 && S(1,80)==1

    validity_table(20,AT_TW20:DT_TW20)=10;
    TOTAL_DISTANCE20=(GATE_DISTANCE9*PE_TW20);

elseif S(1,77)==1 && S(1,78)==0 && S(1,79)==1 && S(1,80)==0

    validity_table(20,AT_TW20:DT_TW20)=11;
    TOTAL_DISTANCE20=(GATE_DISTANCE10*PE_TW20);

elseif S(1,77)==1 && S(1,78)==0 && S(1,79)==1 && S(1,80)==1

    validity_table(20,AT_TW20:DT_TW20)=12;
    TOTAL_DISTANCE20=(GATE_DISTANCE11*PE_TW20);

elseif S(1,77)==1 && S(1,78)==1 && S(1,79)==0 && S(1,80)==0

    validity_table(20,AT_TW20:DT_TW20)=13;
    TOTAL_DISTANCE20=(GATE_DISTANCE12*PE_TW20);

elseif S(1,77)==1 && S(1,78)==1 && S(1,79)==0 && S(1,80)==1

    validity_table(20,AT_TW20:DT_TW20)=14;
    TOTAL_DISTANCE20=(GATE_DISTANCE13*PE_TW20);

elseif S(1,77)==1 && S(1,78)==1 && S(1,79)==1 && S(1,80)==0

    validity_table(20,AT_TW20:DT_TW20)=15;
    TOTAL_DISTANCE20=(GATE_DISTANCE14*PE_TW20);
```

```
elseif S(1,77)==1 && S(1,78)==1 && S(1,79)==1 && S(1,80)==1

   validity_table(20,AT_TW20:DT_TW20)=16;
   TOTAL_DISTANCE20=(GATE_DISTANCE15*PE_TW20);

end


%----------------timewindow21 (KCH) F1000--------------------

if S(1,81)==0 && S(1,82)==0 && S(1,83)==0 && S(1,84)==0

   validity_table(21,AT_TW21:DT_TW21)=1;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE0*PE_TW21)+(TRANSIT_DISTANCE(1,x
_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(1,x_decimal(1,11)+1)*PKB
K_TW21);

elseif S(1,81)==0 && S(1,82)==0 && S(1,83)==0 && S(1,84)==1

   validity_table(21,AT_TW21:DT_TW21)=2;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE1*PE_TW21)+(TRANSIT_DISTANCE(2,x
_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(2,x_decimal(1,11)+1)*PKB
K_TW21);

elseif S(1,81)==0 && S(1,82)==0 && S(1,83)==1 && S(1,84)==0

   validity_table(21,AT_TW21:DT_TW21)=3;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE2*PE_TW21)+(TRANSIT_DISTANCE(3,x
_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(3,x_decimal(1,1)+1)*PKB
K_TW21);

elseif S(1,81)==0 && S(1,82)==0 && S(1,83)==1 && S(1,84)==1

   validity_table(21,AT_TW21:DT_TW21)=4;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE3*PE_TW21)+(TRANSIT_DISTANCE(4,x
_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(4,x_decimal(1,11)+1)*PKB
K_TW21);

elseif S(1,81)==0 && S(1,82)==1 && S(1,83)==0 && S(1,84)==0

   validity_table(21,AT_TW21:DT_TW21)=5;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE4*PE_TW21)+(TRANSIT_DISTANCE(5,x
_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(5,x_decimal(1,11)+1)*PKB
K_TW21);
```

```
elseif S(1,81)==0 && S(1,82)==1 && S(1,83)==0 && S(1,84)==1

   validity_table(21,AT_TW21:DT_TW21)=6;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE5*PE_TW21)+(TRANSIT_DISTANCE(6,x
_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(6,x_decimal(1,11)+1)*PKB
K_TW21);

elseif S(1,81)==0 && S(1,82)==1 && S(1,83)==1 && S(1,84)==0

   validity_table(21,AT_TW21:DT_TW21)=7;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE6*PE_TW21)+(TRANSIT_DISTANCE(7,x
_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(7,x_decimal(1,11)+1)*PKB
K_TW21);

elseif S(1,81)==0 && S(1,82)==1 && S(1,83)==1 && S(1,84)==1

   validity_table(21,AT_TW21:DT_TW21)=8;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE7*PE_TW21)+(TRANSIT_DISTANCE(8,x
_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(8,x_decimal(1,11)+1)*PKB
K_TW21);

elseif S(1,81)==1 && S(1,82)==0 && S(1,83)==0 && S(1,84)==0

   validity_table(21,AT_TW21:DT_TW21)=9;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE8*PE_TW21)+(TRANSIT_DISTANCE(9,x
_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(9,x_decimal(1,11)+1)*PKB
K_TW21);

elseif S(1,81)==1 && S(1,82)==0 && S(1,83)==0 && S(1,84)==1

   validity_table(21,AT_TW21:DT_TW21)=10;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE9*PE_TW21)+(TRANSIT_DISTANCE(10,
x_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(10,x_decimal(1,11)+1)*P
KBK_TW21);

elseif S(1,81)==1 && S(1,82)==0 && S(1,83)==1 && S(1,84)==0

   validity_table(21,AT_TW21:DT_TW21)=11;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE10*PE_TW21)+(TRANSIT_DISTANCE(11
,x_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(11,x_decimal(1,11)+1)*P
KBK_TW21);
```

```
elseif S(1,81)==1 && S(1,82)==0 && S(1,83)==1 && S(1,84)==1

   validity_table(21,AT_TW21:DT_TW21)=12;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE11*PE_TW21)+(TRANSIT_DISTANCE(12
,x_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(12,x_decimal(1,11)+1)*P
KBK_TW21);

elseif S(1,81)==1 && S(1,82)==1 && S(1,83)==0 && S(1,84)==0

   validity_table(21,AT_TW21:DT_TW21)=13;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE12*PE_TW21)+(TRANSIT_DISTANCE(13
,x_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(13,x_decimal(1,11)+1)*P
KBK_TW21);

elseif S(1,81)==1 && S(1,82)==1 && S(1,83)==0 && S(1,84)==1

   validity_table(21,AT_TW21:DT_TW21)=14;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE13*PE_TW21)+(TRANSIT_DISTANCE(14
,x_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(14,x_decimal(1,11)+1)*P
KBK_TW21);

elseif S(1,81)==1 && S(1,82)==1 && S(1,83)==1 && S(1,84)==0

   validity_table(21,AT_TW21:DT_TW21)=15;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE14*PE_TW21)+(TRANSIT_DISTANCE(15
,x_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(15,x_decimal(1,11)+1)*P
KBK_TW21);

elseif S(1,81)==1 && S(1,82)==1 && S(1,83)==1 && S(1,84)==1

   validity_table(21,AT_TW21:DT_TW21)=16;
   TO-
TAL_DISTANCE21=(GATE_DISTANCE15*PE_TW21)+(TRANSIT_DISTANCE(16
,x_decimal(1,1)+1)*PPEN_TW21)+(TRANSIT_DISTANCE(16,x_decimal(1,11)+1)*P
KBK_TW21);

end


%----------------timewindow22--------------------

if S(1,85)==0 && S(1,86)==0 && S(1,87)==0 && S(1,88)==0

   validity_table(22,AT_TW22:DT_TW22)=1;
```

```
    TO-
TAL_DISTANCE22=(GATE_DISTANCE0*PE_TW22)+(TRANSIT_DISTANCE(1,x
_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(1,x_decimal(1,11)+1)*PKB
K_TW22);

elseif S(1,85)==0 && S(1,86)==0 && S(1,87)==0 && S(1,88)==1

    validity_table(22,AT_TW22:DT_TW22)=2;
    TO-
TAL_DISTANCE22=(GATE_DISTANCE1*PE_TW22)+(TRANSIT_DISTANCE(2,x
_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(2,x_decimal(1,11)+1)*PKB
K_TW22);

elseif S(1,85)==0 && S(1,86)==0 && S(1,87)==1 && S(1,88)==0

    validity_table(22,AT_TW22:DT_TW22)=3;
    TO-
TAL_DISTANCE22=(GATE_DISTANCE2*PE_TW22)+(TRANSIT_DISTANCE(3,x
_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(3,x_decimal(1,11)+1)*PKB
K_TW22);

elseif S(1,85)==0 && S(1,86)==0 && S(1,87)==1 && S(1,88)==1

    validity_table(22,AT_TW22:DT_TW22)=4;
    TO-
TAL_DISTANCE22=(GATE_DISTANCE3*PE_TW22)+(TRANSIT_DISTANCE(4,x
_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(4,x_decimal(1,11)+1)*PKB
K_TW22);

elseif S(1,85)==0 && S(1,86)==1 && S(1,87)==0 && S(1,88)==0

    validity_table(22,AT_TW22:DT_TW22)=5;
    TO-
TAL_DISTANCE22=(GATE_DISTANCE4*PE_TW22)+(TRANSIT_DISTANCE(5,x
_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(5,x_decimal(1,11)+1)*PKB
K_TW22);

elseif S(1,85)==0 && S(1,86)==1 && S(1,87)==0 && S(1,88)==1

    validity_table(22,AT_TW22:DT_TW22)=6;
    TO-
TAL_DISTANCE22=(GATE_DISTANCE5*PE_TW22)+(TRANSIT_DISTANCE(6,x
_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(6,x_decimal(1,11)+1)*PKB
K_TW22);

elseif S(1,85)==0 && S(1,86)==1 && S(1,87)==1 && S(1,88)==0

    validity_table(22,AT_TW22:DT_TW22)=7;
```

```
    TO-
TAL_DISTANCE22=(GATE_DISTANCE6*PE_TW22)+(TRANSIT_DISTANCE(7,x
_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(7,x_decimal(1,11)+1)*PKB
K_TW22);

elseif S(1,85)==0 && S(1,86)==1 && S(1,87)==1 && S(1,88)==1

    validity_table(22,AT_TW22:DT_TW22)=8;
    TO-
TAL_DISTANCE22=(GATE_DISTANCE7*PE_TW22)+(TRANSIT_DISTANCE(8,x
_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(8,x_decimal(1,11)+1)*PKB
K_TW22);

elseif S(1,85)==1 && S(1,86)==0 && S(1,87)==0 && S(1,88)==0

    validity_table(22,AT_TW22:DT_TW22)=9;
    TO-
TAL_DISTANCE22=(GATE_DISTANCE8*PE_TW22)+(TRANSIT_DISTANCE(9,x
_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(9,x_decimal(1,11)+1)*PKB
K_TW22);

elseif S(1,85)==1 && S(1,86)==0 && S(1,87)==0 && S(1,88)==1

    validity_table(22,AT_TW22:DT_TW22)=10;
    TO-
TAL_DISTANCE22=(GATE_DISTANCE9*PE_TW22)+(TRANSIT_DISTANCE(10,
x_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(10,x_decimal(1,11)+1)*P
KBK_TW22);

elseif S(1,85)==1 && S(1,86)==0 && S(1,87)==1 && S(1,88)==0

    validity_table(22,AT_TW22:DT_TW22)=11;
    TO-
TAL_DISTANCE22=(GATE_DISTANCE10*PE_TW22)+(TRANSIT_DISTANCE(11
,x_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(11,x_decimal(1,11)+1)*P
KBK_TW22);

elseif S(1,85)==1 && S(1,86)==0 && S(1,87)==1 && S(1,88)==1

    validity_table(22,AT_TW22:DT_TW22)=12;
    TO-
TAL_DISTANCE22=(GATE_DISTANCE11*PE_TW22)+(TRANSIT_DISTANCE(12
,x_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(12,x_decimal(1,11)+1)*P
KBK_TW22);

elseif S(1,85)==1 && S(1,86)==1 && S(1,87)==0 && S(1,88)==0

    validity_table(22,AT_TW22:DT_TW22)=13;
```

```
   TO-
TAL_DISTANCE22=(GATE_DISTANCE12*PE_TW22)+(TRANSIT_DISTANCE(13
,x_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(13,x_decimal(1,11)+1)*P
KBK_TW22);

elseif S(1,85)==1 && S(1,86)==1 && S(1,87)==0 && S(1,88)==1

   validity_table(22,AT_TW22:DT_TW22)=14;
   TO-
TAL_DISTANCE22=(GATE_DISTANCE13*PE_TW22)+(TRANSIT_DISTANCE(14
,x_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(14,x_decimal(1,11)+1)*P
KBK_TW22);

elseif S(1,85)==1 && S(1,86)==1 && S(1,87)==1 && S(1,88)==0

   validity_table(22,AT_TW22:DT_TW22)=15;
   TO-
TAL_DISTANCE22=(GATE_DISTANCE14*PE_TW22)+(TRANSIT_DISTANCE(15
,x_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(15,x_decimal(1,11)+1)*P
KBK_TW22);

elseif S(1,85)==1 && S(1,86)==1 && S(1,87)==1 && S(1,88)==1

   validity_table(22,AT_TW22:DT_TW22)=16;
   TO-
TAL_DISTANCE22=(GATE_DISTANCE15*PE_TW22)+(TRANSIT_DISTANCE(16
,x_decimal(1,2)+1)*PPEN_TW22)+(TRANSIT_DISTANCE(16,x_decimal(1,11)+1)*P
KBK_TW22);

end


%----------------timewindow23--------------------

if S(1,89)==0 && S(1,90)==0 && S(1,91)==0 && S(1,92)==0

   validity_table(23,AT_TW23:DT_TW23)=1;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE0*PE_TW23)+(TRANSIT_DISTANCE(1,x
_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(1,x_decimal(1,11)+1)*PKB
K_TW23);

elseif S(1,89)==0 && S(1,90)==0 && S(1,91)==0 && S(1,92)==1

   validity_table(23,AT_TW23:DT_TW23)=2;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE1*PE_TW23)+(TRANSIT_DISTANCE(2,x
_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(2,x_decimal(1,11)+1)*PKB
K_TW23);
```

```
elseif S(1,89)==0 && S(1,90)==0 && S(1,91)==1 && S(1,92)==0

   validity_table(23,AT_TW23:DT_TW23)=3;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE2*PE_TW23)+(TRANSIT_DISTANCE(3,x
_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(3,x_decimal(1,11)+1)*PKB
K_TW23);

elseif S(1,89)==0 && S(1,90)==0 && S(1,91)==1 && S(1,92)==1

   validity_table(23,AT_TW23:DT_TW23)=4;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE3*PE_TW23)+(TRANSIT_DISTANCE(4,x
_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(4,x_decimal(1,11)+1)*PKB
K_TW23);

elseif S(1,89)==0 && S(1,90)==1 && S(1,91)==0 && S(1,92)==0

   validity_table(23,AT_TW23:DT_TW23)=5;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE4*PE_TW23)+(TRANSIT_DISTANCE(5,x
_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(5,x_decimal(1,11)+1)*PKB
K_TW23);

elseif S(1,89)==0 && S(1,90)==1 && S(1,91)==0 && S(1,92)==1

   validity_table(23,AT_TW23:DT_TW23)=6;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE5*PE_TW23)+(TRANSIT_DISTANCE(6,x
_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(6,x_decimal(1,11)+1)*PKB
K_TW23);

elseif S(1,89)==0 && S(1,90)==1 && S(1,91)==1 && S(1,92)==0

   validity_table(23,AT_TW23:DT_TW23)=7;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE6*PE_TW23)+(TRANSIT_DISTANCE(7,x
_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(7,x_decimal(1,11)+1)*PKB
K_TW23);

elseif S(1,89)==0 && S(1,90)==1 && S(1,91)==1 && S(1,92)==1

   validity_table(23,AT_TW23:DT_TW23)=8;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE7*PE_TW23)+(TRANSIT_DISTANCE(8,x
_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(8,x_decimal(1,11)+1)*PKB
K_TW23);
```

```
elseif S(1,89)==1 && S(1,90)==0 && S(1,91)==0 && S(1,92)==0

   validity_table(23,AT_TW23:DT_TW23)=9;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE8*PE_TW23)+(TRANSIT_DISTANCE(9,x
_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(9,x_decimal(1,11)+1)*PKB
K_TW23);

elseif S(1,89)==1 && S(1,90)==0 && S(1,91)==0 && S(1,92)==1

   validity_table(23,AT_TW23:DT_TW23)=10;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE9*PE_TW23)+(TRANSIT_DISTANCE(10,
x_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(10,x_decimal(1,11)+1)*P
KBK_TW23);
elseif S(1,89)==1 && S(1,90)==0 && S(1,91)==1 && S(1,92)==0

   validity_table(23,AT_TW23:DT_TW23)=11;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE10*PE_TW23)+(TRANSIT_DISTANCE(11
,x_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(11,x_decimal(1,11)+1)*P
KBK_TW23);

elseif S(1,89)==1 && S(1,90)==0 && S(1,91)==1 && S(1,92)==1

   validity_table(23,AT_TW23:DT_TW23)=12;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE11*PE_TW23)+(TRANSIT_DISTANCE(12
,x_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(12,x_decimal(1,11)+1)*P
KBK_TW23);

elseif S(1,89)==1 && S(1,90)==1 && S(1,91)==0 && S(1,92)==0

   validity_table(23,AT_TW23:DT_TW23)=13;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE12*PE_TW23)+(TRANSIT_DISTANCE(13
,x_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(13,x_decimal(1,11)+1)*P
KBK_TW23);

elseif S(1,89)==1 && S(1,90)==1 && S(1,91)==0 && S(1,92)==1

   validity_table(23,AT_TW23:DT_TW23)=14;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE13*PE_TW23)+(TRANSIT_DISTANCE(14
,x_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(14,x_decimal(1,11)+1)*P
KBK_TW23);

elseif S(1,89)==1 && S(1,90)==1 && S(1,91)==1 && S(1,92)==0
```

```
   validity_table(23,AT_TW23:DT_TW23)=15;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE14*PE_TW23)+(TRANSIT_DISTANCE(15
,x_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(15,x_decimal(1,11)+1)*P
KBK_TW23);

elseif S(1,89)==1 && S(1,90)==1 && S(1,91)==1 && S(1,92)==1

   validity_table(23,AT_TW23:DT_TW23)=16;
   TO-
TAL_DISTANCE23=(GATE_DISTANCE15*PE_TW23)+(TRANSIT_DISTANCE(16
,x_decimal(1,2)+1)*PPEN_TW23)+(TRANSIT_DISTANCE(16,x_decimal(1,11)+1)*P
KBK_TW23);

end


%----------------timewindow24--------------------

if S(1,93)==0 && S(1,94)==0 && S(1,95)==0 && S(1,96)==0

   validity_table(24,AT_TW24:DT_TW24)=1;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE0*PE_TW24)+(TRANSIT_DISTANCE(1,x
_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(1,x_decimal(1,12)+1)*PKB
K_TW24);


elseif S(1,93)==0 && S(1,94)==0 && S(1,95)==0 && S(1,96)==1

   validity_table(24,AT_TW24:DT_TW24)=2;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE1*PE_TW24)+(TRANSIT_DISTANCE(2,x
_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(2,x_decimal(1,12)+1)*PKB
K_TW24);

elseif S(1,93)==0 && S(1,94)==0 && S(1,95)==1 && S(1,96)==0

   validity_table(24,AT_TW24:DT_TW24)=3;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE2*PE_TW24)+(TRANSIT_DISTANCE(3,x
_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(3,x_decimal(1,12)+1)*PKB
K_TW24);

elseif S(1,93)==0 && S(1,94)==0 && S(1,95)==1 && S(1,96)==1

   validity_table(24,AT_TW24:DT_TW24)=4;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE3*PE_TW24)+(TRANSIT_DISTANCE(4,x
```

```
_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(4,x_decimal(1,12)+1)*PKB
K_TW24);

elseif S(1,93)==0 && S(1,94)==1 && S(1,95)==0 && S(1,96)==0

   validity_table(24,AT_TW24:DT_TW24)=5;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE4*PE_TW24)+(TRANSIT_DISTANCE(5,x
_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(5,x_decimal(1,12)+1)*PKB
K_TW24);

elseif S(1,93)==0 && S(1,94)==1 && S(1,95)==0 && S(1,96)==1

   validity_table(24,AT_TW24:DT_TW24)=6;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE5*PE_TW24)+(TRANSIT_DISTANCE(6,x
_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(6,x_decimal(1,12)+1)*PKB
K_TW24);

elseif S(1,93)==0 && S(1,94)==1 && S(1,95)==1 && S(1,96)==0

   validity_table(24,AT_TW24:DT_TW24)=7;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE6*PE_TW24)+(TRANSIT_DISTANCE(7,x
_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(7,x_decimal(1,12)+1)*PKB
K_TW24);

elseif S(1,93)==0 && S(1,94)==1 && S(1,95)==1 && S(1,96)==1

   validity_table(24,AT_TW24:DT_TW24)=8;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE7*PE_TW24)+(TRANSIT_DISTANCE(8,x
_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(8,x_decimal(1,12)+1)*PKB
K_TW24);

elseif S(1,93)==1 && S(1,94)==0 && S(1,95)==0 && S(1,96)==0

   validity_table(24,AT_TW24:DT_TW24)=9;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE8*PE_TW24)+(TRANSIT_DISTANCE(9,x
_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(9,x_decimal(1,12)+1)*PKB
K_TW24);

elseif S(1,93)==1 && S(1,94)==0 && S(1,95)==0 && S(1,96)==1

   validity_table(24,AT_TW24:DT_TW24)=10;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE9*PE_TW24)+(TRANSIT_DISTANCE(10,
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```
x_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(10,x_decimal(1,12)+1)*P
KBK_TW24);

elseif S(1,93)==1 && S(1,94)==0 && S(1,95)==1 && S(1,96)==0

   validity_table(24,AT_TW24:DT_TW24)=11;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE10*PE_TW24)+(TRANSIT_DISTANCE(11
,x_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(11,x_decimal(1,12)+1)*P
KBK_TW24);

elseif S(1,93)==1 && S(1,94)==0 && S(1,95)==1 && S(1,96)==1

   validity_table(24,AT_TW24:DT_TW24)=12;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE11*PE_TW24)+(TRANSIT_DISTANCE(12
,x_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(12,x_decimal(1,12)+1)*P
KBK_TW24);

elseif S(1,93)==1 && S(1,94)==1 && S(1,95)==0 && S(1,96)==0

   validity_table(24,AT_TW24:DT_TW24)=13;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE12*PE_TW24)+(TRANSIT_DISTANCE(13
,x_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(13,x_decimal(1,12)+1)*P
KBK_TW24);

elseif S(1,93)==1 && S(1,94)==1 && S(1,95)==0 && S(1,96)==1

   validity_table(24,AT_TW24:DT_TW24)=14;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE13*PE_TW24)+(TRANSIT_DISTANCE(14
,x_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(14,x_decimal(1,12)+1)*P
KBK_TW24);

elseif S(1,93)==1 && S(1,94)==1 && S(1,95)==1 && S(1,96)==0

   validity_table(24,AT_TW24:DT_TW24)=15;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE14*PE_TW24)+(TRANSIT_DISTANCE(15
,x_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(15,x_decimal(1,12)+1)*P
KBK_TW24);

elseif S(1,93)==1 && S(1,94)==1 && S(1,95)==1 && S(1,96)==1

   validity_table(24,AT_TW24:DT_TW24)=16;
   TO-
TAL_DISTANCE24=(GATE_DISTANCE15*PE_TW24)+(TRANSIT_DISTANCE(16
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```
,x_decimal(1,3)+1)*PPEN_TW24)+(TRANSIT_DISTANCE(16,x_decimal(1,12)+1)*P
KBK_TW24);


end


%----------------timewindow25--------------------

if S(1,97)==0 && S(1,98)==0 && S(1,99)==0 && S(1,100)==0

   validity_table(25,AT_TW25:DT_TW25)=1;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE0*PE_TW25)+(TRANSIT_DISTANCE(1,x
_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(1,x_decimal(1,13)+1)*PKB
K_TW25);

elseif S(1,97)==0 && S(1,98)==0 && S(1,99)==0 && S(1,100)==1

   validity_table(25,AT_TW25:DT_TW25)=2;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE1*PE_TW25)+(TRANSIT_DISTANCE(2,x
_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(2,x_decimal(1,13)+1)*PKB
K_TW25);

elseif S(1,97)==0 && S(1,98)==0 && S(1,99)==1 && S(1,100)==0

   validity_table(25,AT_TW25:DT_TW25)=3;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE2*PE_TW25)+(TRANSIT_DISTANCE(3,x
_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(3,x_decimal(1,13)+1)*PKB
K_TW25);

elseif S(1,97)==0 && S(1,98)==0 && S(1,99)==1 && S(1,100)==1

   validity_table(25,AT_TW25:DT_TW25)=4;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE3*PE_TW25)+(TRANSIT_DISTANCE(4,x
_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(4,x_decimal(1,13)+1)*PKB
K_TW25);

elseif S(1,97)==0 && S(1,98)==1 && S(1,99)==0 && S(1,100)==0

   validity_table(25,AT_TW25:DT_TW25)=5;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE4*PE_TW25)+(TRANSIT_DISTANCE(5,x
_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(5,x_decimal(1,13)+1)*PKB
K_TW25);
```

```
elseif S(1,97)==0 && S(1,98)==1 && S(1,99)==0 && S(1,100)==1

   validity_table(25,AT_TW25:DT_TW25)=6;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE5*PE_TW25)+(TRANSIT_DISTANCE(6,x
_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(6,x_decimal(1,13)+1)*PKB
K_TW25);

elseif S(1,97)==0 && S(1,98)==1 && S(1,99)==1 && S(1,100)==0

   validity_table(25,AT_TW25:DT_TW25)=7;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE6*PE_TW25)+(TRANSIT_DISTANCE(7,x
_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(7,x_decimal(1,13)+1)*PKB
K_TW25);

elseif S(1,97)==0 && S(1,98)==1 && S(1,99)==1 && S(1,100)==1

   validity_table(25,AT_TW25:DT_TW25)=8;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE7*PE_TW25)+(TRANSIT_DISTANCE(8,x
_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(8,x_decimal(1,13)+1)*PKB
K_TW25);

elseif S(1,97)==1 && S(1,98)==0 && S(1,99)==0 && S(1,100)==0

   validity_table(25,AT_TW25:DT_TW25)=9;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE8*PE_TW25)+(TRANSIT_DISTANCE(9,x
_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(9,x_decimal(1,13)+1)*PKB
K_TW25);

elseif S(1,97)==1 && S(1,98)==0 && S(1,99)==0 && S(1,100)==1

   validity_table(25,AT_TW25:DT_TW25)=10;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE9*PE_TW25)+(TRANSIT_DISTANCE(10,
x_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(10,x_decimal(1,13)+1)*P
KBK_TW25);

elseif S(1,97)==1 && S(1,98)==0 && S(1,99)==1 && S(1,100)==0

   validity_table(25,AT_TW25:DT_TW25)=11;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE10*PE_TW25)+(TRANSIT_DISTANCE(11
,x_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(11,x_decimal(1,13)+1)*P
KBK_TW25);

elseif S(1,97)==1 && S(1,98)==0 && S(1,99)==1 && S(1,100)==1
```

```
   validity_table(25,AT_TW25:DT_TW25)=12;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE11*PE_TW25)+(TRANSIT_DISTANCE(12
,x_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(12,x_decimal(1,13)+1)*P
KBK_TW25);

elseif S(1,97)==1 && S(1,98)==1 && S(1,99)==0 && S(1,100)==0

   validity_table(25,AT_TW25:DT_TW25)=13;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE12*PE_TW25)+(TRANSIT_DISTANCE(13
,x_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(13,x_decimal(1,13)+1)*P
KBK_TW25);

elseif S(1,97)==1 && S(1,98)==1 && S(1,99)==0 && S(1,100)==1

   validity_table(25,AT_TW25:DT_TW25)=14;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE13*PE_TW25)+(TRANSIT_DISTANCE(14
,x_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(14,x_decimal(1,13)+1)*P
KBK_TW25);

elseif S(1,97)==1 && S(1,98)==1 && S(1,99)==1 && S(1,100)==0

   validity_table(25,AT_TW25:DT_TW25)=15;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE14*PE_TW25)+(TRANSIT_DISTANCE(15
,x_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(15,x_decimal(1,13)+1)*P
KBK_TW25);

elseif S(1,97)==1 && S(1,98)==1 && S(1,99)==1 && S(1,100)==1

   validity_table(25,AT_TW25:DT_TW25)=16;
   TO-
TAL_DISTANCE25=(GATE_DISTANCE15*PE_TW25)+(TRANSIT_DISTANCE(16
,x_decimal(1,5)+1)*PPEN_TW25)+(TRANSIT_DISTANCE(16,x_decimal(1,13)+1)*P
KBK_TW25);


end


%----------------timewindow26--------------------

if S(1,101)==0 && S(1,102)==0 && S(1,103)==0 && S(1,104)==0

   validity_table(26,AT_TW26:DT_TW26)=1;
```

```
    TO-
TAL_DISTANCE26=(GATE_DISTANCE0*PE_TW26)+(TRANSIT_DISTANCE(1,x
_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(1,x_decimal(1,14)+1)*PKB
K_TW26);

elseif S(1,101)==0 && S(1,102)==0 && S(1,103)==0 && S(1,104)==1

    validity_table(26,AT_TW26:DT_TW26)=2;
    TO-
TAL_DISTANCE26=(GATE_DISTANCE1*PE_TW26)+(TRANSIT_DISTANCE(2,x
_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(2,x_decimal(1,14)+1)*PKB
K_TW26);

elseif S(1,101)==0 && S(1,102)==0 && S(1,103)==1 && S(1,104)==0

    validity_table(26,AT_TW26:DT_TW26)=3;
    TO-
TAL_DISTANCE26=(GATE_DISTANCE2*PE_TW26)+(TRANSIT_DISTANCE(3,x
_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(3,x_decimal(1,14)+1)*PKB
K_TW26);

elseif S(1,101)==0 && S(1,102)==0 && S(1,103)==1 && S(1,104)==1

    validity_table(26,AT_TW26:DT_TW26)=4;
    TO-
TAL_DISTANCE26=(GATE_DISTANCE3*PE_TW26)+(TRANSIT_DISTANCE(4,x
_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(4,x_decimal(1,14)+1)*PKB
K_TW26);

elseif S(1,101)==0 && S(1,102)==1 && S(1,103)==0 && S(1,104)==0

    validity_table(26,AT_TW26:DT_TW26)=5;
    TO-
TAL_DISTANCE26=(GATE_DISTANCE4*PE_TW26)+(TRANSIT_DISTANCE(5,x
_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(5,x_decimal(1,14)+1)*PKB
K_TW26);

elseif S(1,101)==0 && S(1,102)==1 && S(1,103)==0 && S(1,104)==1

    validity_table(26,AT_TW26:DT_TW26)=6;
    TO-
TAL_DISTANCE26=(GATE_DISTANCE5*PE_TW26)+(TRANSIT_DISTANCE(6,x
_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(6,x_decimal(1,14)+1)*PKB
K_TW26);

elseif S(1,101)==0 && S(1,102)==1 && S(1,103)==1 && S(1,104)==0

    validity_table(26,AT_TW26:DT_TW26)=7;
```

```
    TO-
TAL_DISTANCE26=(GATE_DISTANCE6*PE_TW26)+(TRANSIT_DISTANCE(7,x
_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(7,x_decimal(1,14)+1)*PKB
K_TW26);

elseif S(1,101)==0 && S(1,102)==1 && S(1,103)==1 && S(1,104)==1

    validity_table(26,AT_TW26:DT_TW26)=8;
    TO-
TAL_DISTANCE26=(GATE_DISTANCE7*PE_TW26)+(TRANSIT_DISTANCE(8,x
_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(8,x_decimal(1,14)+1)*PKB
K_TW26);

elseif S(1,101)==1 && S(1,102)==0 && S(1,103)==0 && S(1,104)==0

    validity_table(26,AT_TW26:DT_TW26)=9;
   TO-
TAL_DISTANCE26=(GATE_DISTANCE8*PE_TW26)+(TRANSIT_DISTANCE(9,x
_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(9,x_decimal(1,14)+1)*PKB
K_TW26);

elseif S(1,101)==1 && S(1,102)==0 && S(1,103)==0 && S(1,104)==1

    validity_table(26,AT_TW26:DT_TW26)=10;
   TO-
TAL_DISTANCE26=(GATE_DISTANCE9*PE_TW26)+(TRANSIT_DISTANCE(10,
x_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(10,x_decimal(1,14)+1)*P
KBK_TW26);

elseif S(1,101)==1 && S(1,102)==0 && S(1,103)==1 && S(1,104)==0

    validity_table(26,AT_TW26:DT_TW26)=11;
   TO-
TAL_DISTANCE26=(GATE_DISTANCE10*PE_TW26)+(TRANSIT_DISTANCE(11
,x_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(11,x_decimal(1,14)+1)*P
KBK_TW26);

elseif S(1,101)==1 && S(1,102)==0 && S(1,103)==1 && S(1,104)==1

    validity_table(26,AT_TW26:DT_TW26)=12;
   TO-
TAL_DISTANCE26=(GATE_DISTANCE11*PE_TW26)+(TRANSIT_DISTANCE(12
,x_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(12,x_decimal(1,14)+1)*P
KBK_TW26);

elseif S(1,101)==1 && S(1,102)==1 && S(1,103)==0 && S(1,104)==0

    validity_table(26,AT_TW26:DT_TW26)=13;
```

```
   TO-
TAL_DISTANCE26=(GATE_DISTANCE12*PE_TW26)+(TRANSIT_DISTANCE(13
,x_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(13,x_decimal(1,14)+1)*P
KBK_TW26);

elseif S(1,101)==1 && S(1,102)==1 && S(1,103)==0 && S(1,104)==1

    validity_table(26,AT_TW26:DT_TW26)=14;
   TO-
TAL_DISTANCE26=(GATE_DISTANCE13*PE_TW26)+(TRANSIT_DISTANCE(14
,x_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(14,x_decimal(1,14)+1)*P
KBK_TW26);

elseif S(1,101)==1 && S(1,102)==1 && S(1,103)==1 && S(1,104)==0

    validity_table(26,AT_TW26:DT_TW26)=15;
   TO-
TAL_DISTANCE26=(GATE_DISTANCE14*PE_TW26)+(TRANSIT_DISTANCE(15
,x_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(15,x_decimal(1,14)+1)*P
KBK_TW26);

elseif S(1,101)==1 && S(1,102)==1 && S(1,103)==1 && S(1,104)==1

    validity_table(26,AT_TW26:DT_TW26)=16;
   TO-
TAL_DISTANCE26=(GATE_DISTANCE15*PE_TW26)+(TRANSIT_DISTANCE(16
,x_decimal(1,6)+1)*PPEN_TW26)+(TRANSIT_DISTANCE(16,x_decimal(1,14)+1)*P
KBK_TW26);


end


%----------------timewindow27--------------------

if S(1,105)==0 && S(1,106)==0 && S(1,107)==0 && S(1,108)==0

    validity_table(27,AT_TW27:DT_TW27)=1;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE0*PE_TW27)+(TRANSIT_DISTANCE(1,x
_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(1,x_decimal(1,16)+1)*PKB
K_TW27);

elseif S(1,105)==0 && S(1,106)==0 && S(1,107)==0 && S(1,108)==1

    validity_table(27,AT_TW27:DT_TW27)=2;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE1*PE_TW27)+(TRANSIT_DISTANCE(2,x
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```
_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(2,x_decimal(1,16)+1)*PKB
K_TW27);

elseif S(1,105)==0 && S(1,106)==0 && S(1,107)==1 && S(1,108)==0

    validity_table(27,AT_TW27:DT_TW27)=3;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE2*PE_TW27)+(TRANSIT_DISTANCE(3,x
_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(3,x_decimal(1,16)+1)*PKB
K_TW27);

elseif S(1,105)==0 && S(1,106)==0 && S(1,107)==1 && S(1,108)==1

    validity_table(27,AT_TW27:DT_TW27)=4;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE3*PE_TW27)+(TRANSIT_DISTANCE(4,x
_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(4,x_decimal(1,16)+1)*PKB
K_TW27);

elseif S(1,105)==0 && S(1,106)==1 && S(1,107)==0 && S(1,108)==0

    validity_table(27,AT_TW27:DT_TW27)=5;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE4*PE_TW27)+(TRANSIT_DISTANCE(5,x
_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(5,x_decimal(1,16)+1)*PKB
K_TW27);

elseif S(1,105)==0 && S(1,106)==1 && S(1,107)==0 && S(1,108)==1

    validity_table(27,AT_TW27:DT_TW27)=6;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE5*PE_TW27)+(TRANSIT_DISTANCE(6,x
_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(6,x_decimal(1,16)+1)*PKB
K_TW27);

elseif S(1,105)==0 && S(1,106)==1 && S(1,107)==1 && S(1,108)==0

    validity_table(27,AT_TW27:DT_TW27)=7;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE6*PE_TW27)+(TRANSIT_DISTANCE(7,x
_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(7,x_decimal(1,16)+1)*PKB
K_TW27);

elseif S(1,105)==0 && S(1,106)==1 && S(1,107)==1 && S(1,108)==1

    validity_table(27,AT_TW27:DT_TW27)=8;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE7*PE_TW27)+(TRANSIT_DISTANCE(8,x
```

```
_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(8,x_decimal(1,16)+1)*PKB
K_TW27);

elseif S(1,105)==1 && S(1,106)==0 && S(1,107)==0 && S(1,108)==0

    validity_table(27,AT_TW27:DT_TW27)=9;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE8*PE_TW27)+(TRANSIT_DISTANCE(9,x
_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(9,x_decimal(1,16)+1)*PKB
K_TW27);

elseif S(1,105)==1 && S(1,106)==0 && S(1,107)==0 && S(1,108)==1

    validity_table(27,AT_TW27:DT_TW27)=10;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE9*PE_TW27)+(TRANSIT_DISTANCE(10,
x_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(10,x_decimal(1,16)+1)*P
KBK_TW27);

elseif S(1,105)==1 && S(1,106)==0 && S(1,107)==1 && S(1,108)==0

    validity_table(27,AT_TW27:DT_TW27)=11;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE10*PE_TW27)+(TRANSIT_DISTANCE(11
,x_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(11,x_decimal(1,16)+1)*P
KBK_TW27);

elseif S(1,105)==1 && S(1,106)==0 && S(1,107)==1 && S(1,108)==1

    validity_table(27,AT_TW27:DT_TW27)=12;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE11*PE_TW27)+(TRANSIT_DISTANCE(12
,x_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(12,x_decimal(1,16)+1)*P
KBK_TW27);

elseif S(1,105)==1 && S(1,106)==1 && S(1,107)==0 && S(1,108)==0

    validity_table(27,AT_TW27:DT_TW27)=13;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE12*PE_TW27)+(TRANSIT_DISTANCE(13
,x_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(13,x_decimal(1,16)+1)*P
KBK_TW27);

elseif S(1,105)==1 && S(1,106)==1 && S(1,107)==0 && S(1,108)==1

    validity_table(27,AT_TW27:DT_TW27)=14;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE13*PE_TW27)+(TRANSIT_DISTANCE(14
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```
,x_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(14,x_decimal(1,16)+1)*P
KBK_TW27);

elseif S(1,105)==1 && S(1,106)==1 && S(1,107)==1 && S(1,108)==0

    validity_table(27,AT_TW27:DT_TW27)=15;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE14*PE_TW27)+(TRANSIT_DISTANCE(15
,x_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(15,x_decimal(1,16)+1)*P
KBK_TW27);

elseif S(1,105)==1 && S(1,106)==1 && S(1,107)==1 && S(1,108)==1

    validity_table(27,AT_TW27:DT_TW27)=16;
   TO-
TAL_DISTANCE27=(GATE_DISTANCE15*PE_TW27)+(TRANSIT_DISTANCE(16
,x_decimal(1,8)+1)*PPEN_TW27)+(TRANSIT_DISTANCE(16,x_decimal(1,16)+1)*P
KBK_TW27);


end



%----------------timewindow28 (LAST FLIGHT)--------------------

if S(1,109)==0 && S(1,110)==0 && S(1,111)==0 && S(1,112)==0

    validity_table(28,AT_TW28:DT_TW28)=1;
   TOTAL_DISTANCE28=(GATE_DISTANCE0*PE_TW28);

elseif S(1,109)==0 && S(1,110)==0 && S(1,111)==0 && S(1,112)==1

    validity_table(28,AT_TW28:DT_TW28)=2;
   TOTAL_DISTANCE28=(GATE_DISTANCE1*PE_TW28);

elseif S(1,109)==0 && S(1,110)==0 && S(1,111)==1 && S(1,112)==0

    validity_table(28,AT_TW28:DT_TW28)=3;
   TOTAL_DISTANCE28=(GATE_DISTANCE2*PE_TW28);

elseif S(1,109)==0 && S(1,110)==0 && S(1,111)==1 && S(1,112)==1

    validity_table(28,AT_TW28:DT_TW28)=4;
   TOTAL_DISTANCE28=(GATE_DISTANCE3*PE_TW28);

elseif S(1,109)==0 && S(1,110)==1 && S(1,111)==0 && S(1,112)==0

    validity_table(28,AT_TW28:DT_TW28)=5;
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```
   TOTAL_DISTANCE28=(GATE_DISTANCE4*PE_TW28);

elseif S(1,109)==0 && S(1,110)==1 && S(1,111)==0 && S(1,112)==1

    validity_table(28,AT_TW28:DT_TW28)=6;
   TOTAL_DISTANCE28=(GATE_DISTANCE5*PE_TW28);

elseif S(1,109)==0 && S(1,110)==1 && S(1,111)==1 && S(1,112)==0

    validity_table(28,AT_TW28:DT_TW28)=7;
   TOTAL_DISTANCE28=(GATE_DISTANCE6*PE_TW28);

elseif S(1,109)==0 && S(1,110)==1 && S(1,111)==1 && S(1,112)==1

    validity_table(28,AT_TW28:DT_TW28)=8;
   TOTAL_DISTANCE28=(GATE_DISTANCE7*PE_TW28);

elseif S(1,109)==1 && S(1,110)==0 && S(1,111)==0 && S(1,112)==0

    validity_table(28,AT_TW28:DT_TW28)=9;
   TOTAL_DISTANCE28=(GATE_DISTANCE8*PE_TW28);

elseif S(1,109)==1 && S(1,110)==0 && S(1,111)==0 && S(1,112)==1

    validity_table(28,AT_TW28:DT_TW28)=10;
   TOTAL_DISTANCE28=(GATE_DISTANCE9*PE_TW28);

elseif S(1,109)==1 && S(1,110)==0 && S(1,111)==1 && S(1,112)==0

    validity_table(28,AT_TW28:DT_TW28)=11;
   TOTAL_DISTANCE28=(GATE_DISTANCE10*PE_TW28);

elseif S(1,109)==1 && S(1,110)==0 && S(1,111)==1 && S(1,112)==1

    validity_table(28,AT_TW28:DT_TW28)=12;
   TOTAL_DISTANCE28=(GATE_DISTANCE11*PE_TW28);

elseif S(1,109)==1 && S(1,110)==1 && S(1,111)==0 && S(1,112)==0

    validity_table(28,AT_TW28:DT_TW28)=13;
   TOTAL_DISTANCE28=(GATE_DISTANCE12*PE_TW28);

elseif S(1,109)==1 && S(1,110)==1 && S(1,111)==0 && S(1,112)==1

    validity_table(28,AT_TW28:DT_TW28)=14;
    TOTAL_DISTANCE28=(GATE_DISTANCE13*PE_TW28);

elseif S(1,109)==1 && S(1,110)==1 && S(1,111)==1 && S(1,112)==0
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```
    validity_table(28,AT_TW28:DT_TW28)=15;
    TOTAL_DISTANCE28=(GATE_DISTANCE14*PE_TW28);

elseif S(1,109)==1 && S(1,110)==1 && S(1,111)==1 && S(1,112)==1

    validity_table(28,AT_TW28:DT_TW28)=16;
    TOTAL_DISTANCE28=(GATE_DISTANCE15*PE_TW28);


end


%----------------timewindow29 (LAST FLIGHT)--------------------

if S(1,113)==0 && S(1,114)==0 && S(1,115)==0 && S(1,116)==0

    validity_table(29,AT_TW29:DT_TW29)=1;
    TOTAL_DISTANCE29=(GATE_DISTANCE0*PE_TW29);

elseif S(1,113)==0 && S(1,114)==0 && S(1,115)==0 && S(1,116)==1

    validity_table(29,AT_TW29:DT_TW29)=2;
    TOTAL_DISTANCE29=(GATE_DISTANCE1*PE_TW29);

elseif S(1,113)==0 && S(1,114)==0 && S(1,115)==1 && S(1,116)==0

    validity_table(29,AT_TW29:DT_TW29)=3;
    TOTAL_DISTANCE29=(GATE_DISTANCE2*PE_TW29);

elseif S(1,113)==0 && S(1,114)==0 && S(1,115)==1 && S(1,116)==1

    validity_table(29,AT_TW29:DT_TW29)=4;
    TOTAL_DISTANCE29=(GATE_DISTANCE3*PE_TW29);

elseif S(1,113)==0 && S(1,114)==1 && S(1,115)==0 && S(1,116)==0

    validity_table(29,AT_TW29:DT_TW29)=5;
    TOTAL_DISTANCE29=(GATE_DISTANCE4*PE_TW29);

elseif S(1,113)==0 && S(1,114)==1 && S(1,115)==0 && S(1,116)==1

    validity_table(29,AT_TW29:DT_TW29)=6;
    TOTAL_DISTANCE29=(GATE_DISTANCE5*PE_TW29);

elseif S(1,113)==0 && S(1,114)==1 && S(1,115)==1 && S(1,116)==0

    validity_table(29,AT_TW29:DT_TW29)=7;
    TOTAL_DISTANCE29=(GATE_DISTANCE6*PE_TW29);
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```
elseif S(1,113)==0 && S(1,114)==1 && S(1,115)==1 && S(1,116)==1

   validity_table(29,AT_TW29:DT_TW29)=8;
   TOTAL_DISTANCE29=(GATE_DISTANCE7*PE_TW29);

elseif S(1,113)==1 && S(1,114)==0 && S(1,115)==0 && S(1,116)==0

   validity_table(29,AT_TW29:DT_TW29)=9;
   TOTAL_DISTANCE29=(GATE_DISTANCE8*PE_TW29);

elseif S(1,113)==1 && S(1,114)==0 && S(1,115)==0 && S(1,116)==1

   validity_table(29,AT_TW29:DT_TW29)=10;
   TOTAL_DISTANCE29=(GATE_DISTANCE9*PE_TW29);

elseif S(1,113)==1 && S(1,114)==0 && S(1,115)==1 && S(1,116)==0

   validity_table(29,AT_TW29:DT_TW29)=11;
   TOTAL_DISTANCE29=(GATE_DISTANCE10*PE_TW29);

elseif S(1,113)==1 && S(1,114)==0 && S(1,115)==1 && S(1,116)==1

   validity_table(29,AT_TW29:DT_TW29)=12;
   TOTAL_DISTANCE29=(GATE_DISTANCE11*PE_TW29);

elseif S(1,113)==1 && S(1,114)==1 && S(1,115)==0 && S(1,116)==0

   validity_table(29,AT_TW29:DT_TW29)=13;
   TOTAL_DISTANCE29=(GATE_DISTANCE12*PE_TW29);

elseif S(1,113)==1 && S(1,114)==1 && S(1,115)==0 && S(1,116)==1

   validity_table(29,AT_TW29:DT_TW29)=14;
   TOTAL_DISTANCE29=(GATE_DISTANCE13*PE_TW29);

elseif S(1,113)==1 && S(1,114)==1 && S(1,115)==1 && S(1,116)==0

   validity_table(29,AT_TW29:DT_TW29)=15;
   TOTAL_DISTANCE29=(GATE_DISTANCE14*PE_TW29);

elseif S(1,113)==1 && S(1,114)==1 && S(1,115)==1 && S(1,116)==1

   validity_table(29,AT_TW29:DT_TW29)=16;
   TOTAL_DISTANCE29=(GATE_DISTANCE15*PE_TW29);


end
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```
%----------------timewindow30 (LAST FLIGHT)--------------------

if S(1,117)==0 && S(1,118)==0 && S(1,119)==0 && S(1,120)==0

   validity_table(30,AT_TW30:DT_TW30)=1;
   TOTAL_DISTANCE30=(GATE_DISTANCE0*PE_TW30);

elseif S(1,117)==0 && S(1,118)==0 && S(1,119)==0 && S(1,120)==1

   validity_table(30,AT_TW30:DT_TW30)=2;
   TOTAL_DISTANCE30=(GATE_DISTANCE1*PE_TW30);

elseif S(1,117)==0 && S(1,118)==0 && S(1,119)==1 && S(1,120)==0

   validity_table(30,AT_TW30:DT_TW30)=3;
   TOTAL_DISTANCE30=(GATE_DISTANCE2*PE_TW30);

elseif S(1,117)==0 && S(1,118)==0 && S(1,119)==1 && S(1,120)==1

   validity_table(30,AT_TW30:DT_TW30)=4;
   TOTAL_DISTANCE30=(GATE_DISTANCE3*PE_TW30);

elseif S(1,117)==0 && S(1,118)==1 && S(1,119)==0 && S(1,120)==0

   validity_table(30,AT_TW30:DT_TW30)=5;
   TOTAL_DISTANCE30=(GATE_DISTANCE4*PE_TW30);

elseif S(1,117)==0 && S(1,118)==1 && S(1,119)==0 && S(1,120)==1

   validity_table(30,AT_TW30:DT_TW30)=6;
   TOTAL_DISTANCE30=(GATE_DISTANCE5*PE_TW30);

elseif S(1,117)==0 && S(1,118)==1 && S(1,119)==1 && S(1,120)==0

   validity_table(30,AT_TW30:DT_TW30)=7;
   TOTAL_DISTANCE30=(GATE_DISTANCE6*PE_TW30);

elseif S(1,117)==0 && S(1,118)==1 && S(1,119)==1 && S(1,120)==1

   validity_table(30,AT_TW30:DT_TW30)=8;
   TOTAL_DISTANCE30=(GATE_DISTANCE7*PE_TW30);

elseif S(1,117)==1 && S(1,118)==0 && S(1,119)==0 && S(1,120)==0

   validity_table(30,AT_TW30:DT_TW30)=9;
   TOTAL_DISTANCE30=(GATE_DISTANCE8*PE_TW30);

elseif S(1,117)==1 && S(1,118)==0 && S(1,119)==0 && S(1,120)==1
```

```
    validity_table(30,AT_TW30:DT_TW30)=10;
    TOTAL_DISTANCE30=(GATE_DISTANCE9*PE_TW30);

elseif S(1,117)==1 && S(1,118)==0 && S(1,119)==1 && S(1,120)==0

    validity_table(30,AT_TW30:DT_TW30)=11;
    TOTAL_DISTANCE30=(GATE_DISTANCE10*PE_TW30);

elseif S(1,117)==1 && S(1,118)==0 && S(1,119)==1 && S(1,120)==1

    validity_table(30,AT_TW30:DT_TW30)=12;
    TOTAL_DISTANCE30=(GATE_DISTANCE11*PE_TW30);

elseif S(1,117)==1 && S(1,118)==1 && S(1,119)==0 && S(1,120)==0

    validity_table(30,AT_TW30:DT_TW30)=13;
    TOTAL_DISTANCE30=(GATE_DISTANCE12*PE_TW30);

elseif S(1,117)==1 && S(1,118)==1 && S(1,119)==0 && S(1,120)==1

    validity_table(30,AT_TW30:DT_TW30)=14;
    TOTAL_DISTANCE30=(GATE_DISTANCE13*PE_TW30);

elseif S(1,117)==1 && S(1,118)==1 && S(1,119)==1 && S(1,120)==0

    validity_table(30,AT_TW30:DT_TW30)=15;
    TOTAL_DISTANCE30=(GATE_DISTANCE14*PE_TW30);

elseif S(1,117)==1 && S(1,118)==1 && S(1,119)==1 && S(1,120)==1

    validity_table(30,AT_TW30:DT_TW30)=16;
    TOTAL_DISTANCE30=(GATE_DISTANCE15*PE_TW30);


end


%----------------timewindow31 (LAST FLIGHT)--------------------


if S(1,121)==0 && S(1,122)==0 && S(1,123)==0 && S(1,124)==0

    validity_table(31,AT_TW31:DT_TW31)=1;
    TOTAL_DISTANCE31=(GATE_DISTANCE0*PE_TW31);

elseif S(1,121)==0 && S(1,122)==0 && S(1,123)==0 && S(1,124)==1

    validity_table(31,AT_TW31:DT_TW31)=2;
    TOTAL_DISTANCE31=(GATE_DISTANCE1*PE_TW31);
```

```
elseif S(1,121)==0 && S(1,122)==0 && S(1,123)==1 && S(1,124)==0

   validity_table(31,AT_TW31:DT_TW31)=3;
   TOTAL_DISTANCE31=(GATE_DISTANCE2*PE_TW31);

elseif S(1,121)==0 && S(1,122)==0 && S(1,123)==1 && S(1,124)==1

   validity_table(31,AT_TW31:DT_TW31)=4;
   TOTAL_DISTANCE31=(GATE_DISTANCE3*PE_TW31);

elseif S(1,121)==0 && S(1,122)==1 && S(1,123)==0 && S(1,124)==0

   validity_table(31,AT_TW31:DT_TW31)=5;
   TOTAL_DISTANCE31=(GATE_DISTANCE4*PE_TW31);

elseif S(1,121)==0 && S(1,122)==1 && S(1,123)==0 && S(1,124)==1

   validity_table(31,AT_TW31:DT_TW31)=6;
   TOTAL_DISTANCE31=(GATE_DISTANCE5*PE_TW31);

elseif S(1,121)==0 && S(1,122)==1 && S(1,123)==1 && S(1,124)==0

   validity_table(31,AT_TW31:DT_TW31)=7;
   TOTAL_DISTANCE31=(GATE_DISTANCE6*PE_TW31);

elseif S(1,121)==0 && S(1,122)==1 && S(1,123)==1 && S(1,124)==1

   validity_table(31,AT_TW31:DT_TW31)=8;
   TOTAL_DISTANCE31=(GATE_DISTANCE7*PE_TW31);


elseif S(1,121)==1 && S(1,122)==0 && S(1,123)==0 && S(1,124)==0

   validity_table(31,AT_TW31:DT_TW31)=9;
   TOTAL_DISTANCE31=(GATE_DISTANCE8*PE_TW31);

elseif S(1,121)==1 && S(1,122)==0 && S(1,123)==0 && S(1,124)==1

   validity_table(31,AT_TW31:DT_TW31)=10;
   TOTAL_DISTANCE31=(GATE_DISTANCE9*PE_TW31);

elseif S(1,121)==1 && S(1,122)==0 && S(1,123)==1 && S(1,124)==0

   validity_table(31,AT_TW31:DT_TW31)=11;
   TOTAL_DISTANCE31=(GATE_DISTANCE10*PE_TW31);

elseif S(1,121)==1 && S(1,122)==0 && S(1,123)==1 && S(1,124)==1
```

```
    validity_table(31,AT_TW31:DT_TW31)=12;
    TOTAL_DISTANCE31=(GATE_DISTANCE11*PE_TW31);

elseif S(1,121)==1 && S(1,122)==1 && S(1,123)==0 && S(1,124)==0

    validity_table(31,AT_TW31:DT_TW31)=13;
    TOTAL_DISTANCE31=(GATE_DISTANCE12*PE_TW31);

elseif S(1,121)==1 && S(1,122)==1 && S(1,123)==0 && S(1,124)==1

    validity_table(31,AT_TW31:DT_TW31)=14;
    TOTAL_DISTANCE31=(GATE_DISTANCE13*PE_TW31);

elseif S(1,121)==1 && S(1,122)==1 && S(1,123)==1 && S(1,124)==0

    validity_table(31,AT_TW31:DT_TW31)=15;
    TOTAL_DISTANCE31=(GATE_DISTANCE14*PE_TW31);

elseif S(1,121)==1 && S(1,122)==1 && S(1,123)==1 && S(1,124)==1

    validity_table(31,AT_TW31:DT_TW31)=16;
    TOTAL_DISTANCE31=(GATE_DISTANCE15*PE_TW31);

end


%----------------total distance--------------------

TO-
TAL_DISTANCE=TOTAL_DISTANCE_FIRST_FLIGHT+(TOTAL_DISTANCE1+T
OTAL_DISTANCE2+TOTAL_DISTANCE3+TOTAL_DISTANCE4+TOTAL_DIST
ANCE5+TOTAL_DISTANCE6+TOTAL_DISTANCE7+TOTAL_DISTANCE8+TOT
AL_DISTANCE9+TOTAL_DISTANCE10+TOTAL_DISTANCE11+TOTAL_DISTA
NCE12+TOTAL_DISTANCE13+TOTAL_DISTANCE14+TOTAL_DISTANCE15+T
OTAL_DISTANCE16+TOTAL_DISTANCE17+TOTAL_DISTANCE18+TOTAL_DI
STANCE19+TOTAL_DISTANCE20+TOTAL_DISTANCE21+TOTAL_DISTANCE2
2+TOTAL_DISTANCE23+TOTAL_DISTANCE24+TOTAL_DISTANCE25+TOTAL
_DISTANCE26+TOTAL_DISTANCE27+TOTAL_DISTANCE28+TOTAL_DISTAN
CE29+TOTAL_DISTANCE30+TOTAL_DISTANCE31);
```