Question 1
An automated guided vehicle system is proposed to deliver parts the workstations in a factory. The required number of deliveries per hour = 70. Average loaded travel distance is 80 mt. The average travel distance empty is not known. Vehicles move at speed = 40 mt/min. Anticipated traffic load factor = 0.85 and availability =0.9. Develop the equation relate the number of vehicles required to operate the system as function of the average empty travel distance; hence assume the empty travel distance is 100 mt and determine the number of vehicles.

Question 2
Automated guided vehicle system is proposed to deliver parts the workstations in a factory. The required number of deliveries per hour = 80. Average loaded travel distance is 80m. The average travel distance empty is not known. Vehicles move at speed = 40m/min. Anticipated traffic load factor =0.85 and availability =0.9. Develop the equation relate the number of vehicles required to operate the system as function of the average empty travel distance; hence assume the empty travel distance is 100m and determine the number of vehicles**.**

Question 3
An automated guided vehicle system is proposed to deliver parts to workstations in a factory. The required number of deliveries per hour = 30. Average loaded travel distance is 100 mt. The average travel distance empty is not known. Vehicles move at speed = 40 mt/min. the load and unload times are each 0.75 min. Anticipated traffic load .9, availability =0.95 and effieciency =0.85. **Develop** the equation relate the number of vehicles required to operate the system as function of the average empty travel distance; hence assume the empty travel distance is 100 mt and determine the number of vehicles.

Question 4
AGV system is being proposed to deliver parts between 25 workstations in a factory. The delivery rate is 35 loads/hr. Average loaded travel distance and empty travel distance are estimated to be 100m and 200m respectively. Vehicles moves at speed 80m/min. Loading and unloading time per delivery is 1.0 min. Traffic factor is related to the number of vehicles n_v as $F_t = 1.0 – 0.1(n_v – 1)$ for $n_v > 1$ integer values. Determine the minimum number of vehicles needed in the factory to meet the flow rate requirement.

Question 5
AGV system is being proposed to deliver parts between 20 workstations in a factory. The delivery rate is 40 loads/hr. Average loaded travel distance and empty travel distance are estimated to be 80m and 100m respectively. Vehicles moves at speed 60m/min. Loading and unloading time per delivery is 0.75 min. Traffic factor is related to the number of vehicles n_v as $F_t = 1.0 – 0.05(n_v – 1)$ for $n_v > 1$ integer values. Determine the minimum number of vehicles needed in the factory to meet the flow rate requirement.

Question 6
An AGV system is being proposed to deliver parts between 40 workstations in a factory. The delivery rate = 40 loads/hr Determine the number of vehicles ($\boldsymbol{n_c}$) needed to meet the flow rate if the following data given:

- Average loaded travel distance = 300 m
- Average empty travel distance = 350 m
- Vehicle speed = 75 m/min
- Total handling time per delivery (loading and unloading) = 1.5 min
- Traffic factor varies with number of vehicles as: $\boldsymbol{F_t}$=1.0–0.05($\boldsymbol{n_c}$-1). For, $\boldsymbol{n_c}$=Integer >0.
- Availability =1.0

Question 7

An AGV system is proposed to deliver parts between five workstations in a factory. The layout of the workstations is shown in figure (a). The required flow is given in table (5). AGV moves at speed = 40 m/min. and takes 1 minute to load and unload. Anticipated traffic load factor = 0.85 and availability =0.9.

a. Write the equation relating the number of AGV required to operate the system as function of the average travel distance.
b. Determine the number of AGV.
c. Determine the routing of the AGV.

TABLE (5)

	1	2	3	4	5
1	-	10	25	0	15
2	0	-	10	25	15
3	25	10	-	0	20
4	0	25	0	-	20
5	15	15	20	20	-

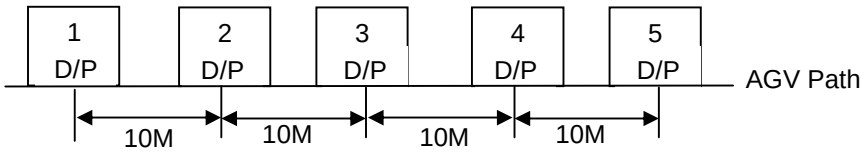

Figure (a)

Question 8

An AGV system is proposed to deliver parts between five workstations in a factory. The layout of the workstations is shown in figure (a). The required flow is given in table (4). AGV moves at speed = 40 m/min. and takes 0.75 minute to load and unload. Anticipated traffic load factor = 0.9 and availability =0.9.

a) Determine the number of AGV.
b) Determine the routing of the AGV.

TABLE (4)

	1	2	3	4	5	6
1	-	20	50	0	30	0
2	0	-	20	50	30	10
3	50	20	-	0	40	0
4	0	50	0	-	40	50
5	30	30	40	40	-	10
6	0	10	0	40	20	-

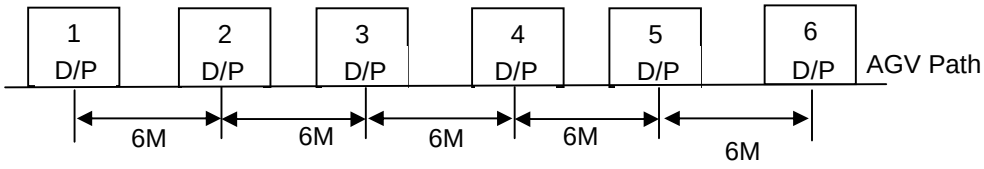

Figure (a)

Question 9

An AGV system is proposed to deliver parts between six workstations in a factory. The layout of the workstations is shown in figure (a). The required flow is given in table (3). AGV moves at speed = 50 m/min. and the load and unload takes 0.75 minute each. Anticipated traffic load factor = 0.9 and availability =0.9. Write the equation relating the number of AGV required to operate the system as function of the average travel distance.

i. Determine the number of AGV, comment on the value of number of AGV and how can be reduced.
ii. Determine the AGV routing.

TABLE (3) trips/day						
	A	B	C	D	E	F
A	-	40	25	0	25	0
B	20	-	30	25	0	20
C	25	30	-	0	20	0
D	0	25	0	-	20	20
E	25	0	20	0	-	25
F	0	20	0	20	25	-

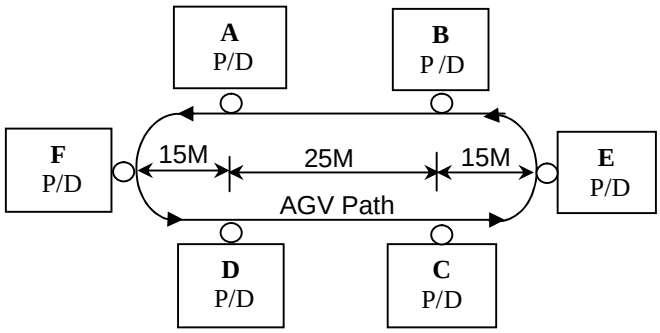

Figure (a)

Question 10

In a manufacturing plant, an AGV system is proposed to deliver parts between five departments. The layout is shown in figure (a). The required flow is given in table (1). AGV moves anticlockwise at speed = 40 m/min. Each of loading time and unloading time takes 1 minute. Anticipated Traffic factor is related to the number of vehicles n_v as $F_t = 1.0 - 0.06(n_v - 1)$ for n_v >1 integer values.and availability =0.9.

a) Write the equation relating the number of AGV required to operate the system as function of the average travel distance.
b) Determine the number of AGV, comment on the value of number of AGV and how can be reduced.
c) Determine the routing of the AGV.

Table (1) Pallet moves per day					
From/To	A	B	C	D	E
A	-	25	40	0	0
B	20	-	15	30	25
C	0	0	-	55	20
D	0	25	15	-	60
E	45	35	25	0	-

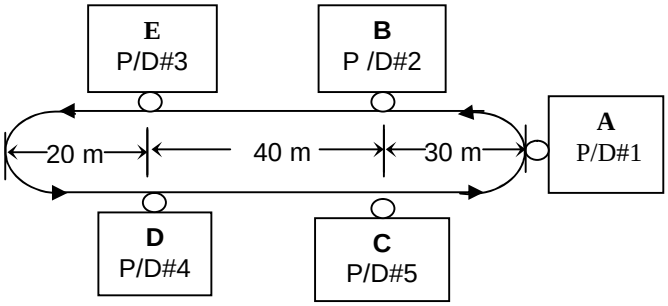

Figure (a)

Question 11

In a manufacturing plant, an AGV system is proposed to deliver parts between five departments. The layout is shown in figure (a). The required flow is given in table (3). AGV moves anticlockwise at speed = 40 m/min. Each of loading time and unloading time takes 1 minute. Anticipated traffic load factor = 0.85 and availability =0.9.

a) Write the equation relating the number of AGV required to operate the system as function of the average travel distance.
b) Determine the number of AGV.
c) Determine the routing of the AGV.

Table (3) Pallet moves per day					
From/To	A	B	C	D	E
A	-	20	35	0	0
B	15	-	10	25	20
C	0	0	-	50	15
D	0	20	10	-	55
E	40	30	20	0	-

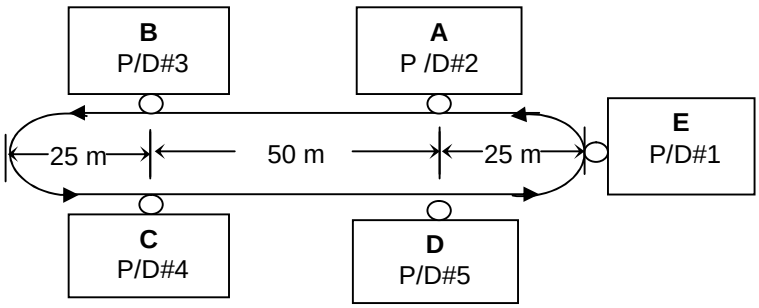

Figure (a)

Question 11

In a manufacturing plant, an AGV system is proposed to deliver parts between six departments. The layout is shown in figure (a). The required flow is given in table (1). AGV moves anticlockwise at speed = 40 m/min. Each of loading time and unloading time takes 1 minute. Anticipated Traffic factor is 0.85 and availability =0.9.

a) Write the equation relating the number of AGV required to operate the system as function of the average travel distance.
b) Determine the number of AGV.
c) Determine the routing of the AGV.

Table (1) Pallet moves per day

From/To	A	B	C	D	E	F
A	-	25	40	0	0	15
B	20	-	15	30	25	20
C	0	0	-	55	20	15
D	0	25	30	-	40	0
E	30	35	25	0	-	15
F	30	0	20	0	10	-

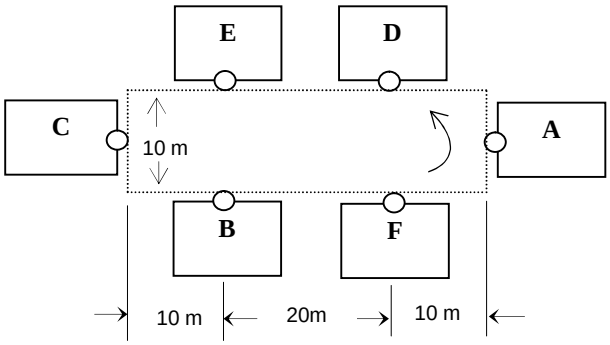

Figure (a)

Question 12

An AGV is being designed for four-department layout with one drop/delivery point for each department as shown in figure (1). The departments are of equal area (20m X20m). Table (1) gives the load moves between the departments. AGV's travel 1 m/sec., and takes 1 minute to load and unload. Compute: -

i) The required number of vehicles for the given path.
ii) The AGV routes.

A	B
C	D

Figure (1)

TABLE (1)

	A	B	C	D
A	-	8	12	4
B	0	-	8	12
B	12	4	-	4
C	0	0	12	-

Question 13

An AGV is being designd for four department layout with one drop/delivery point for departments 1,3,4 and drop point away from delivery point for department 2 as shown in figure (1). Table(4) gives the load moves between the departments. AGV's travel 1 m/sec., and takes 1 minute to load and unload. Compute:-

i) The number of vechiles for the given path, comment on the value of number of AGV and how can be reduced.
ii) The AGV routes.

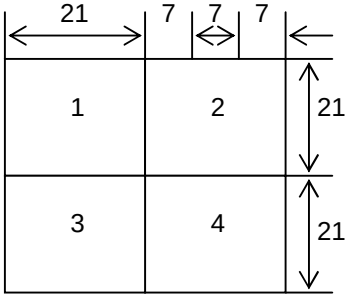

Figure (1)

TABLE (4)

	1	2	3	4
1	-	10	25	0
2	0	-	10	25
3	15	5	-	0
4	0	25	0	-

Question 14

In a manufacturing plant, an AGV system is proposed to deliver parts between six equal area departments (10mx10m). The layout is shown in figure (a). The required flow is given in table (4). AGV moves anticlockwise at speed = 40 m/min. The loading time and unloading time takes one minute each. Anticipated traffic load factor = 0.85 and availability =0.9.

d) Write the equation relating the number of AGV required operating the system as function of the average travel distance.
e) Design the path of AGV assuming single point for pickup and delivery
f) Determine the number of AGV.
g) Determine the routing of the AGV.

A	D	F
B	C	E

Figure (a)

Table (5) trips/day						
	A	**B**	**C**	**D**	**E**	**F**
A	-	40	25	0	25	0
B	20	-	30	25	0	20
C	25	30	-	0	20	0
D	0	25	0	-	20	20
E	25	0	20	0	-	25
F	0	20	0	20	25	-

Question 15

In a manufacturing plant, an AGV system is proposed to deliver parts between five departments with dimension as shown in figure (a). The required flow is given in table (5). AGV moves anticlockwise at speed = 35 m/min. The loading time and unloading time takes one minute each. Anticipated traffic load factor = 0.85 and availability of the AGV=0.9.

a) Write the equation relating the number of AGV required operating the system as function of the average travel distance.
b) Design the path of AGV assuming single point for pickup and delivery
c) Determine the number of AGV.
d) Determine the routing of the AGV.

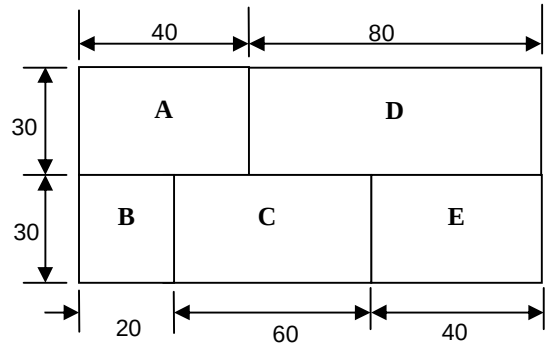

Figure (a)

Table (5) trips/day					
	A	**B**	**C**	**D**	**E**
A	-	60	35	0	25
B	40	-	30	25	0
C	35	30	-	0	25
D	0	25	0	-	25
E	25	0	20	0	-

Question 16

An AGV is being designd for six departments layout with one drop/delivery point for each departments as shown in figure (1). The departments are of equal area(20m X20m). Table(5) gives the load moves between the departments. AGV's travel 1 m/sec., and takes 1 minute to load and unload. Compute:-

iii) The required number of vechiles for the given path.
iv) The AGV routes.

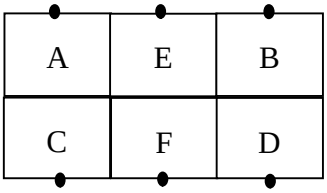

Figure (1)

Table (5)

	A	B	C	D	E	F
A	-	8	12	4	18	10
B	0	-	8	12	0	15
C	12	8	-	10	15	0
D	0	0	10	-	15	8
E	10	10	5	0	-	14
F	0	9	10	7	0	-

Question 17

In a manufacturing plant, an AGV system is proposed to deliver parts between six equal area departments (10mx10m). The layout is shown in figure (a). The required flow is given in table (3). AGV moves anticlockwise at speed = 40 m/min. The loading time and unloading time takes one minute each. Anticipated traffic load factor = 0.85 and availability =0.9.

a) Write the equation relating the number of AGV required operating the system as function of the average travel distance.
b) Design the path of AGV assuming single point for pickup and delivery.
c) Determine the number of AGV.
d) Determine the routing of the AGV.

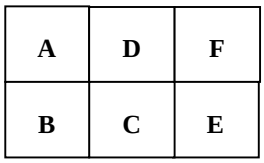

Figure (a)

Table (3) trips/day

	A	**B**	**C**	**D**	**E**	**F**
A	-	40	25	0	25	0
B	20	-	30	25	0	20
C	25	30	-	0	20	0
D	0	25	0	-	20	20
E	25	0	20	0	-	25
F	0	20	0	20	25	-