

Total No. of Questions : 8]

SEAT No. :

P-653

[Total No. of Pages : 5

[6004]-614

B.E. (Mechanical Engineering)

OPERATION RESEARCH

(2019 Pattern) (Semester - VII) (402045D) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Answers in one answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume Suitable data, if necessary.*

Q1) a) Use Simplex method to solve the following LPP. [10]

Maximize $Z = 2X_1 + X_2$

Subject to Constraints

$$4X_1 + 3X_2 \leq 12;$$

$$4X_1 + X_2 \leq 8;$$

$$4X_1 - X_2 \leq 8;$$

$$X_1, X_2 \geq 0;$$

b) Write the generalised syntax of LPP and discuss the following terms related to LPP. [7]

- i) Objective function
- ii) Constraint surface
- iii) Feasible and infeasible points
- iv) Optimum solution

OR

Q2) a) Use Graphical method to solve the following LPP. [10]

Minimize $Z = 10 X_1 + 4X_2$

Subject to Constraints

$$3X_1 + 2X_2 \geq 60$$

$$7X_1 + 2X_2 \geq 84$$

$$3X_1 + 6X_2 \geq 72$$

$$X_1, X_2 \geq 0$$

b) Explain with the help of example generalized syntax and various terms involved in the LPP. [7]

P.T.O.

Q3) a) Discuss the following related to the transportation model : [8]

- i) Feasible solution
- ii) Optimum Solution
- iii) Non-degenerate Basic feasible Solution
- iv) Degenerate basic Feasible Solution

b) Find out the initial feasible solution by Vogel's Approximation Method (VAM). [10]

		Stores				Availability
		I	II	III	IV	
Warehouse	A	21	16	15	13	11
	B	17	18	14	23	13
Requirement	C	32	27	28	41	19
		6	10	12	15	

OR

Q4) a) An airline company has drawn up a new flight schedule that involves five flights. To assist in allocating five pilot to the five flights, it has asked them to state their preference scores by giving each flight a number out of 10. The higher the number, the greater is the preference. A few of these flights are unsuitable to some pilots, owing to domestic reasons. These have been marked with "X"

		Flight Number				
		I	II	III	IV	V
Pilot	A	8	2	X	5	4
	B	10	9	2	8	4
	C	5	4	9	6	X
	D	3	6	2	8	7
	E	5	6	10	4	5

What should be the allocation of the pilots in order to meet maximum preference? [12]

b) Differentiate between assignment and transportation problem. [6]

- Q5) a) A bank has decided to modernize its office .The major elements of the project are as follows. [12]

Activity	Description	Predecessor Activity	Duration (Days)
A	Design New premises	----	14
B	Obtain tenders from contractors	A	4
C	Select the contractor	B	2
D	Arrange details with selected contractor	C	1
E	Decide which equipment is to be used	A	2
F	Arrange storage of equipment	E	3
G	Arrange disposal of other equipment	E	2
H	Order new equipment	E	4
I	Take delivery of new equipment	H, L	3
J	Renovations take place	K	12
K	Remove old equipment for storage or disposal	D, F, G	4
L	Cleaning after the contractor finished	J	2
M	Return old equipment for storage	H, L	2

- i) Draw an arrow diagram for this project.
- ii) Find out the critical path
- iii) For each non-critical activity find out the total, free and independent float or Slacks.

- b) Explain in brief Following (Any 3): [6]
- Gradual failure
 - Sudden failure
 - Progressive failure
 - Retrogressive failure
 - Random failure

OR

- Q6) a) A truck owner finds from his past records that the maintenance cost per year of a truck whose purchase price is Rs. 8,000 are as follows :

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs)	1000	1300	1700	2000	2900	3800	4800	6000
Resale price (Rs)	4000	2000	1200	600	500	400	400	400

Determine at which time it is profitable to replace the truck. [10]

- b) Differentiate between CPM and PERT and also discuss various floats involved in the in CPM analysis of network. [8]

- Q7) a) A company has five salesmen who have to be allocated to four marketing zones. The return (profit) from each zone depends upon the numbers of salesman working in that zone. The expected return for different numbers of salesman in different zones, as estimated from the past record, are given in the following table. Determine the optimum allocation policy. (Use DP) [12]

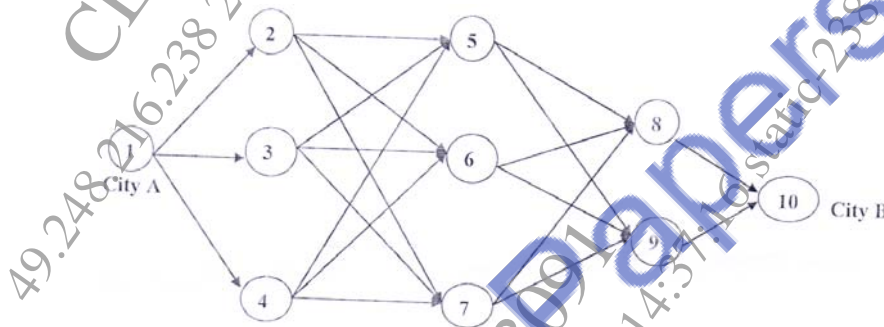
Number of salesman	Marketing Zones		
	Zone I	Zone 2	Zone 3
0	30	35	42
1	45	45	54
2	60	52	60
3	70	64	70
4	79	72	82
5	90	82	95
6	98	93	102
7	105	98	110
8	100	100	110
9	90	100	110

- b) Write short note on Monto Carlo Simulation. [5]

OR

Q8) a) A salesman located in a city A decided to travel to city B. He knew the distances of alternative routes from city A to city B. He then drew a highway network map as shown in following figure. The city of origin A, is city 1. The destination city B is city 10. Other cities through which the salesman will have to pass through are numbered 2 to 9. The arrow representing routes between cities and distances in kilometres are located on each route. The salesman problem is to find the shortest route that covers all the selected cities from A to B. The time for each activity is given in the table. (Solve by using Dynamic programming).

[12]



Activity	Duration	Activity	Duration
1-2	4	4-5	6
1-3	6	4-6	10
1-4	3	4-7	5
2-5	7	5-8	4
2-6	10	5-9	8
2-7	5	6-8	3
3-5	3	6-9	7
3-6	8	7-8	8
3-7	4	7-9	4
		8-10	7
		9-10	9

b) Explain in brief various steps involved in the simulation.

[5]

