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B TECH

(SEM-VIII) THEORY EXAMINATION 2018-19

OPERATIONS RESEARCH

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a. What are major limitations of simulation?
b. What are slack and surplus variable?
c. What do you mean by an unbalanced transportation problem?
d. What are the three types of floats?
e. What is Operations research?
f. Write the differences between CPM and PERT.
g. What are the classifications of inventory model?
h. Define a saddle point.
i. What do you understand by a queuing theory?
j. Define holding and ordering cost.

SECTION B

2. Attempt any *three* of the following: **10x3=30**

a. A factory produces two products A and B in three plants 1, 2 and 3. In plant 1, a maximum of 4 hours is used for producing 1 batch of A where each batch is produced in 1 hour. In plant 2, only B is produced and each batch takes 2 hours. A maximum of 12 hours is available. Plant 3 produces both A and B and each batch require 3 and 2 hours respectively. A maximum of 18 hours can be used there.
The profit generated by A and B in the market is RS. 3000 and 5000 respectively.
Use simplex method to find out how much the factory should produce of each A and B to maximize profit.

b. Find the basic feasible solution of the following transportation problem by north-west corner rule. Also find the optimal transportation plan.

	1	2	3	4	5	Supply
A	4	3	1	2	6	80
B	5	2	3	4	5	60
C	3	5	6	3	2	40
D	2	4	4	5	3	20
Demand	60	60	30	40	10	200/200

c. Using the principle of dominance solve the following game.

	Player B		
Player A	3	-2	4
	-1	4	2
	2	2	6

d. A company has a demand of 12,000 units/year for an item and it can produce 2,000 such items per month. The cost of one setup is Rs. 400 and the holding cost /unit/month is Rs. 0.15. Find the optimum lot size and the total cost per year, assuming the cost of 1 unit as Rs. 4. Also find the maximum inventory, manufacturing time and total time.

e. A small project consists of seven activities given below:

Activity	Preceding activities	Duration(days)
A	-	4
B	-	7
C	-	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

i. Draw the network diagram and find project completion time.

ii. Calculate the total float, free float & independent float for each activity.

SECTION C

3. Attempt any *one* part of the following: 10x1=10

a. Solve LPP by graphical method.

$$\text{Max } Z = 100x_1 + 40x_2$$

Subject to,

$$5x_1 + 2x_2 \leq 1000$$
$$3x_1 + 2x_2 \leq 900$$
$$x_1 + 2x_2 \leq 500$$
$$x_1, x_2 \geq 0$$

b. Solve by the dual simplex method the following LPP

$$\text{Min } Z = 5x_1 + 6x_2$$

Subject to,

$$x_1 + x_2 \geq 2$$
$$4x_1 + x_2 \geq 4$$
$$x_1, x_2 \geq 0$$

4. Attempt any *one* part of the following: 10x1=10

a. A company has one surplus truck in each of the cites A, B, C, D & E and one deficit truck in each if the cites 1, 2, 3, 4, 5 & 6. The distance between the cities in kilometers is shown in matrix below. Find the assignment of trucks from cities in surplus to cities in deficit so that the total distance covered by vehicle is minimum.

	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

b. Discuss VAM and MODI method with example.

5. Attempt any *one* part of the following: 10x1=10

a. Solve the following 2*3 game graphically.

	Player B		
	1	3	11
Player A	8	5	2

b. Determine the optimal sequence needed to process jobs 1 and 2 on five machines A, B, C, D& E with help of graphical method. Foe each machine finds the job which should be done first. Also calculate the total time needed to complete both jobs.

Job 1	**Sequence**	**A**	**B**	**C**	**D**	**E**
	Time (hrs.)	1	2	3	5	1
Job 2	**Sequence**	**C**	**A**	**D**	**E**	**B**
	Time (hrs.)	3	4	2	1	5

6. Attempt any *one* part of the following: 10x1=10

a. The demand rate of a particular item is 12,000 units per year. The set-up cost per run is RS. 350 and the holding cost is RS. 0.20 Per unit, per month. If no shortage are allowed and the replacement is instantaneous, determine
i. The optimum run size.
ii. The optimum scheduling period.
iii. Minimum total expected annual cost.

b. Explain how do you apply Monte-Carlo simulation technique for queuing problem.

7. Attempt any *one* part of the following: 10x1=10

a. In a railway yard, goods trains arrive at a rate of 30 trains per day. Assuming that inter-arrival time and service time distribution follows an exponential distribution with an average of 30 minutes. Determine :
i. The mean queue size.
ii. The probability that queue size exceeds 10.
iii. If the input of the train increase of 33 per day, what will be the changes in mean queue size and probability that queue size exceeds 10

b. Consider the following project.

Activity	**Time estimate in weeks**			**Predecessor**
	t_o	t_m	t_p	
A	3	6	9	-
B	2	5	8	-
C	2	4	6	A
D	2	3	10	B
E	1	3	11	B
F	4	6	8	C, D
G	1	5	15	E

Find the path and standard deviation. Also find the probability of completing the project by 18 weeks.