

Time: Three Hours

Maximum Marks: 80

“Please check whether you have got the right question paper.”

- i) Attempt any three questions from each section.
- ii) Assume suitable data if necessary.
- iii) Figure to right indicates full marks.

SECTION-A

- Q.1 a) Explain the phases of O.R study 05
 b) A dealer wishes to purchase a number of fans & sewing machines. He has only Rs.5760 to invest & 08
 has space for 20 items only. A fan cost Rs.360 & a sewing machine cost Rs.240. he can sell a fan at a
 profit of Rs.22 and a sewing machine at a profit of Rs18. Assuming that he can sell all items that he
 buys, formulate the problem as a LPP and solve graphically.

- Q.2 Solve using Big-M method, the following LPP 13
 Minimize $z = 3x_1 + 8x_2$
 subject to $x_1 + x_2 = 200$
 $x_1 \leq 80$
 $x_2 \geq 60$
 $\&x_1, x_2 \geq 0$

- Q.3 Solve the following LPP using two phase method 14
 Maximize $z = 5x_1 - 4x_2 + 3x_3$
 Subjected to $2x_1 + x_2 - 6x_3 = 20$
 $6x_1 + 5x_2 + 10x_3 \leq 76$
 $8x_1 - 3x_2 + 6x_3 \leq 50$
 $\&x_1, x_2, x_3 \geq 0$

- Q.4 Table below shows unit transportation cost from various go-downs to market area with their capacity 13
 & requirements. Find IBFS using Vogel’s approximation method & also find the optimum solution

	M ₁	M ₂	M ₃	M ₄	Capacity
G ₁	15	20	22	24	100
G ₂	18	17	12	10	200
G ₃	11	9	5	13	250
Requirements	75	75	275	125	

- Q.5 a) Solve the following assignment problem for maximization 05
 jobs

	J ₁	J ₂	J ₃	J ₄	J ₅
W ₁	14	27	8	24	24
W ₂	8	27	10	21	32
W ₃	16	15	4	27	32
W ₄	12	15	16	30	40
W ₅	14	24	20	27	36

workers

- b) A manufacturer, finds from his past records that the costs per year associated with a machine with a purchase price of Rs.50,000 are given below 08

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs)	15000	16000	18000	21000	25000	29000	34000	40000
Scrap value	35000	25000	17000	12000	10000	5000	4000	4000

Determine the optimum policy

SECTION-B

- Q.6 a) The arrival rate of a customer at a service window of a cinema hall follows a probability distribution with a mean rate of 45 per hour. The service rate of the clerk follows Poisson distribution with a mean of 60 per hour. Find 08

- 1) Average number of customer in the system (Ls)
- 2) The average queue length (Lq)
- 3) The average waiting time in the system (Ws)
- 4) The average waiting time in the queue (Wq)

- b) Six jobs are to be processed on two machines, A & B. The time in hours taken by each job on each machine is given below : 06

	A	B
1	5	3
2	3	2
3	2	5
4	10	11
5	12	10
6	6	7

Determine the optimum sequence of jobs that minimize the total elapsed time to complete the jobs & idle time for both machines

- Q.7 a) Explain how the value of 2 x 2 game with pure strategy & mixed strategy is obtained 05
 b) Find the value of the following game using dominance property 08

		Player B			
		B ₁	B ₂	B ₃	B ₄
Player A	A ₁	-1	2	3	0
	A ₂	-4	-1	-1	0
	A ₃	-1	1	1	0
	A ₄	4	-1	2	-7

- Q.8 a) What is inventory? Explain the classification of inventories. 06
 b) Alpha industry estimates that it will sell 12000 units of its product for the forth coming year. The ordering cost is Rs. 100 per order and the carrying cost per unit per year is 20% of the purchase price per unit. The purchase price per unit is Rs. 50. Find 07
- a) Economic order quantity
 - b) No. of orders per year
 - c) Time taken between successive orders

Q.9

A project consists of the following activities. Find the optimum project time & corresponding minimum total project cost by crashing appropriate activities in proper order. Indirect cost per day is Rs.400

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Activity	Time		Cost (Rs)	
	Normal (days)	Crash (days)	Normal	Crash
1-2	9	4	1300	2400
1-3	15	13	1000	1380
2-3	7	4	7000	1540
2-4	7	3	1200	1920
2-5	12	6	1700	2240
3-6	12	11	600	700
4-5	6	2	1000	1600
5-6	9	6	900	1200

Q.10

Project schedule has the following characteristics

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Activity	t_0	t_m	t_p
1-2	1	2	3
2-3	1	2	3
2-4	1	3	5
3-5	3	4	5
4-5	2	3	4
4-6	3	5	7
5-7	4	5	6
6-7	6	7	8
7-8	2	4	6
7-9	4	6	8
8-10	1	2	3
9-10	3	5	7

- 1) Construct the project network
- 2) Find expected durations & variance for each activity.
- 3) Find the critical path & expected project length.
- 4) What is the probability of completing the project in 30 days