

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)**

III B.Tech II Semester Regular/Supplementary Examinations, April - 2024

OPERATIONS RESEARCH

(ME)

Time: 3 hours

Max. Marks: 70 M

**Answer ONE Question from each Unit
All Questions Carry Equal Marks**

Q. No.		Questions	BTL	CO	Marks																														
UNIT – I																																			
1.	a)	Explain various phases of Operations Research.	K1	CO1	4M																														
	b)	Solve the following linear programming problem by simplex method. Maximize $Z=5X_1+3X_2$ subject to constraints $3X_1+5X_2 \leq 15$, $5X_1+2X_2 \leq 10$ and $X_1, X_2 \geq 0$	K3	CO1	10M																														
OR																																			
2.	a)	State different types of models used in operation research. Explain any two in detail.	K2	CO1	4M																														
	b)	Solve graphically, Maximize $Z = 3x_1 + 5x_2$ Subject to $2x_1 + 6x_2 \leq 15$ $3x_1 + 2x_2 \leq 35$ $5x_1 - 3x_2 \leq 10$ $x_2 \leq 20$ and $x_1, x_2 \geq 0$	K3	CO1	10M																														
UNIT – II																																			
3.	a)	Explain with example ‘North-west Corner Rule’.	K2	CO2	4M																														
	b)	Solve the following maximum transportation problem by using 3 methods <table border="1"><tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>supply</td></tr><tr><td>1</td><td>19</td><td>30</td><td>50</td><td>10</td><td>7</td></tr><tr><td>2</td><td>70</td><td>30</td><td>40</td><td>60</td><td>9</td></tr><tr><td>3</td><td>40</td><td>08</td><td>70</td><td>20</td><td>18</td></tr><tr><td>demand</td><td>5</td><td>8</td><td>7</td><td>14</td><td></td></tr></table>		A	B	C	D	supply	1	19	30	50	10	7	2	70	30	40	60	9	3	40	08	70	20	18	demand	5	8	7	14		K3	CO2	10M
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OR																																			
4.	a)	Distinguish between assignment and transportation problems.	K1	CO2	4M																														
	b)	Solve the following travelling salesman problem. <table border="1"><tr><td></td><td colspan="4">To</td></tr><tr><td rowspan="5">From</td><td></td><td>A</td><td>B</td><td>C</td><td>D</td></tr><tr><td>A</td><td>-</td><td>46</td><td>16</td><td>40</td></tr><tr><td>B</td><td>41</td><td>-</td><td>50</td><td>40</td></tr><tr><td>C</td><td>82</td><td>32</td><td>-</td><td>60</td></tr><tr><td>D</td><td>40</td><td>40</td><td>36</td><td>-</td></tr></table>		To				From		A	B	C	D	A	-	46	16	40	B	41	-	50	40	C	82	32	-	60	D	40	40	36	-	K3	CO2
	To																																		
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	D	40	40	36	-																														

UNIT – III

5.	a)	Explain the principle assumptions made while dealing with sequencing problems.	K2	CO3	4M																	
	b)	A book binder has one printing press, one binding machine and manuscripts of five different books, the time required to perform the printing and binding operations for each book are known. Determine the order in which books should be processed, in order to minimize the total time required to turn-out all the books. Also find the total elapsed time and idle time of each machine. <table border="1"> <tr> <td>Block</td><td>I</td><td>II</td><td>III</td><td>IV</td><td>V</td></tr> <tr> <td>M1 (Painting Machine)</td><td>3</td><td>7</td><td>4</td><td>5</td><td>7</td></tr> <tr> <td>M2 (Painting Machine)</td><td>6</td><td>2</td><td>7</td><td>3</td><td>4</td></tr> </table>	Block	I	II	III	IV	V	M1 (Painting Machine)	3	7	4	5	7	M2 (Painting Machine)	6	2	7	3	4	K3	CO3
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M1 (Painting Machine)	3	7	4	5	7																	
M2 (Painting Machine)	6	2	7	3	4																	

OR

6.	a)	Explain “present worth factor” in replacement analysis.	K2	CO3	4M
	b)	Find the economic life of the machine which has been purchased at a cost of Rs. 1, 60,000. The value of the machine is depreciated in the first three years by Rs. 20,000 each year and Rs. 16,000 per year thereafter. Its maintenance and operating costs for the first three years are Rs. 16,000, Rs. 18,000 and Rs. 20,000 in that order and increases by Rs 4000 every year.	K3	CO3	10M

UNIT – IV

7.	a)	Write the brief description of the various types of queues.	K2	CO4	4M
	b)	Self-service store employs one cashier at its cash counter. 9 customers are arriving on an average every 5 minutes, while the cashier can serve 10 customers in 5 minutes. Assuming the Poisson distribution for arrival rate and exponential distribution for service time, find: i) Average number of customers in the system, ii) Average number of customers in the queue, iii) Average time a customer spends in the system, iv) Average time a customer waits before being served?	K3	CO4	10M

OR

8.	a)	Define the following terms in dynamic programming, (i) State (ii) State Variable	K1	CO4	4M
	b)	State and explain Bellman’s principal of optimality in dynamic programming	K3	CO4	10M

UNIT – V

9.	a)	Define the terms, (i) Inventory (ii) Economic order quantity	K1	CO5	4M
	b)	Derive the mathematical equation for EOQ. What are the assumptions involved?	K3	CO5	10M

OR

10.	a)	Summarize the costs that are involved in carrying inventory in detail.	K1	CO5	4M
	b)	Find the re-order point, the maximum, minimum and the average inventory. A company uses annually 48,000 units of raw material costing Rs 1.25 per unit. Placing order costs Rs. 45 and carrying cost is 15% of average inventory. Find the EOQ. Suppose the company follows EOQ policy and it operates for 300 days in a year. The procurement time is 12 days with a safety stock of 500 units.	K3	CO5	10M