Code: 19HS1702

IV B.Tech - I Semester – Regular Examinations - DECEMBER 2022

OPERATIONS RESEARCH
(MECHANICAL ENGINEERING)

Duration: 3 hours   Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level   CO – Course Outcome

PART – A

		BL	CO
1. a)	Write the general structure of linear programming problem.	L2	CO1
1. b)	What do you mean by constrained assignment problem?	L2	CO2
1. c)	What is the general structure of queuing model?	L2	CO3
1. d)	Write some applications of group replacement.	L2	CO4
1. e)	Write the assumptions of basic inventory model.	L2	CO5

PART – B

			BL	CO	Max. Marks
		UNIT-I			
2	a)	Explain various operations research models.	L2	CO1	4 M
	b)	Old hens can be brought at Rs. 20 each and young ones at Rs. 50 each. The old ones lay 3 eggs per week and young ones lay 5 eggs per week, each egg being worth of Rs 1.50. A hen (young or old) cost Rs. 1.50 per week to feed. I have only Rs. 800 to spend for hens. Calculate how many of each kind should I buy to give profit of at least Rs 60 per week, assume I cannot house more than 20 hens.	L3	CO1	8 M

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<tr><td colspan="6" align="center">**OR**</td></tr>
<tr>
<td>3</td>
<td>a)</td>
<td>Explain the terms constraints, objective function, feasible solution and basic variables in a linear programming problem.</td>
<td>L2</td>
<td>CO1</td>
<td>2 M</td>
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<td></td>
<td>b)</td>
<td>Solve the following LPP by Big-M method
Minimize $z = 5x_1 + 3x_2$
Subjected to $2x_1 + 4x_2 \leq 12$
                 $2x_1 + 2x_2 = 10$
                 $5x_1 + 2x_2 \geq 10$
And $x_1 \geq 0, \quad x_2 \geq 0$</td>
<td>L3</td>
<td>CO1</td>
<td>10 M</td>
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<tr><td colspan="6" align="center">**UNIT-II**</td></tr>
<tr>
<td>4</td>
<td>a)</td>
<td>Explain the general Mathematical model of transportation problem.</td>
<td>L2</td>
<td>CO2</td>
<td>4 M</td>
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<td>b)</td>
<td>The following table shows all the necessary information on the availability of supply to each warehouse, the requirement of each market and the unit transportation cost from each warehouse to each market.

Ware house	I	II	III	IV	Available supply
A	5	2	4	3	22
B	4	8	1	6	15
C	4	6	7	5	8
Requirement	7	12	17	9	

Find the optimal schedule and calculate minimum total cost of shipping</td>
<td>L3</td>
<td>CO2</td>
<td>8 M</td>
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<tr><td colspan="6" align="center">**OR**</td></tr>
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<td>5</td>
<td>a)</td>
<td>Briefly explain about the assignment problems in OR and applications of assignment problems in OR.</td>
<td>L2</td>
<td>CO2</td>
<td>4 M</td>
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<td>b)</td>
<td>Solve the following assignment problem to minimize the total time of the operator

Operator	1	2	3	4	5
1	6	2	5	2	6
2	2	5	8	7	7
3	7	8	6	9	8
4	6	2	3	4	5
5	9	3	8	9	7
6	4	7	4	6	8
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<td>L3</td>
<td>CO2</td>
<td>8 M</td>
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UNIT-III

6	a)	Explain the terms single server & multiple server and finite que length & infinite que length.	L2	CO3	4 M
	b)	At a railway station only one train is handled at a time. The railway track is sufficient only for two trains to wait while others are given signal to leave the station. Trains arrive at the station at an average rate of 6 per hours and the railway station can handle them on an average of 12 per hours. Assuming Poisson arrivals and exponential service distribution, find the steady state probability of the various number of trains in the system. Also calculate the average number of trains in the system.	L3	CO3	8 M

OR

7	Find the sequence that minimizes total machining time to complete the following data and calculate the idle times of the machines.	L3	CO3	12 M

Machines	tasks					
	A	B	C	D	E	F
Time on machine-I	4	9	8	5	10	9
Time on machine-II	5	4	3	6	2	5
Time on machine-III	7	8	6	12	6	7

UNIT-IV

8	a)	Explain two person zero sum game and 'n' person game.	L2	CO4	4 M
	b)	Solve the following game	L4	CO4	8 M

	Y_1	Y_2	Y_3
X_1	4	20	6
X_2	18	12	10

OR

9	The data collected in running a Machine the cost of which is Rs.60,000 are given below.	L4	CO4	12 M

Year	1	2	3	4	5
Resale value (Rs.)	42,000	30,000	20,400	14,400	9,650
Cost of spares(Rs.)	4,000	4,270	4,880	5,700	6,800
Cost of labour(Rs.)	14,000	16,000	18,000	21,000	25,000

Find the time when the machine should be replaced?

UNIT-V

10	a)	What are inventory models? Enumerate various types of inventory models and describe them briefly.	L2	CO5	4 M
	b)	A company requires 1000 units of an item per annum. The cost of ordering is Rs 100 per order. The inventory carrying cost is 20%. The unit price of the item is Rs 10. Calculate a) Economic order quantity b) Optimal total annual cost c) Time between the orders.	L3	CO5	8 M

OR

11	a)	What is simulation? Discuss application of simulation.	L2	CO5	4 M
	b)	A company manufactures around 200 mopeds depending upon the availability of raw materials and other conditions. The daily production has been varying from 196 mopeds to 204 mopeds. Whose probability distribution are given below:	L4	CO5	8 M

Prod./day	196	197	198	199	200	201	202	203	204
Probability	0.05	0.09	0.12	0.14	0.20	0.15	0.11	0.08	0.06

Finished mopeds are transported to a lorry that can accommodate only 200 mopeds. Random numbers are 82,89,78,24,53,61,18,45,04,23,50,77,54 and 10. Simulate the mopeds waiting.