U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 20ME5DCORE **Max Marks: 100**
Course: Operations Research

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

		UNIT - I	CO	PO	Marks
1	a)	List and explain the steps in conducting an operation research study.	*CO1*	*PO1,2,5*	**06**
	b)	The manager of an oil refinery has to decide upon the optimal mix of two possible blending process of which the inputs and outputs per production run are as given below.	*CO1*	*PO1,2,5*	**14**

-	Input (units)		Output (units)	
Process	Crude A	Crude B	Gasoline X	Gasoline Y
1	5	3	5	8
2	4	5	4	4

The maximum amounts available of crude A and B are 200 and 150 units respectively. Market requirement shows that at least 100 units of gasoline X and 80 units of gasoline-Y must be produced. The profit per production run from process 1 and process 2 are Rs.300 and Rs.400 respectively. Solve the LPP by graphical method.

		OR			
2	a)	Solve the following LPP by Simplex method Maximize $Z = 3X_1 + 5X_2 + 4X_3$ Subject to, $2X_1 + 3X_2 \leq 8$ $2X_2 + 5X_3 \leq 10$ $3X_1 + 2X_2 + 4X_3 \leq 15$ $X_1, X_2, X_3 \geq 0$	*CO1*	*PO1,2,5*	**14**
	b)	Explain in detail various characteristics of OR models.	*CO1*	*PO1,2,5*	**06**
		UNIT - II			
3	a)	Write the dual of the LPP Max $Z = x + 2y$ Subject to, $2x + 3y \geq 4$ $3x + 4y = 5$ $x \geq 0$ and y unrestricted.	*CO2*	*PO1,2,5*	**06**

	b)	Use dual simplex method to solve the LPP Max $Z = -2X_1 - X_3$ Subject to, $X_1 + X_2 - X_3 \geq 5$ $X_1 - 2X_2 + 4X_3 \geq 8$ $X_1, X_2, X_3 \geq 0$	*CO2*	*PO1,2,5*	**14**
		UNIT - III			
4	a)	Explain clearly unbalanced transportation and degenerate transportation problem.	*CO3*	*PO1,2,5*	**06**
	b)	ABC limited has three production shops supplying a product to five warehouses. The cost of production varies from shop to shop and cost of transportation from one shop to a warehouse also varies. Each shop has a specific production capacity and each warehouse has certain amount of requirement. The cost of transportation are given below:	*CO3*	*PO1,2,5*	**14**
		OR			
5	a)	A truck company on a particular day has 5 truck for sending material to 6 terminals The cost of sending material from same destination to different trucks will be different as given by the cost matrix below. Find the assignment of 4 trucks to 4 terminals out of 6 at the minimum cost.	*CO3*	*PO1,2,5*	**10**
	b)	Solve the travelling salesman problem given by the following data C_{12} =20, C_{13} =4, C_{14} =10, C_{23} =5, C_{34} =6, C_{25} =10, C_{35} =6, C_{45} =20 and C_{ij}= C_{ji}. There is no route between cities i and j, if the value is not shown.	*CO3*	*PO1,2,5*	**10**
		UNIT - IV			
6	a)	Determine the minimum elapsed time for completing following two jobs. Details of processing times(in minutes) and the sequence of operations are given below: Job 1: A-4 to C-2 to D-6 to E-3 to B-2 Job 2: C-8 to A-3 to D-4 to B-2 to E-3 Also determine the sequence of jobs on each machine.	*CO4*	*PO1,2,5*	**10**

Shop	Warehouse					Capacity	Cost of production
	I	II	III	IV	V		
A	6	4	4	7	5	100	14
B	5	6	7	4	8	1205	26
C	3	4	6	3	4	175	15
Requirement	60	80	85	105	70		

Trucks

Terminals	**A**	**B**	**C**	**D**	**E**
1	3	6	2	6	5
2	7	1	4	4	7
3	3	8	5	8	3
4	6	4	3	7	4
5	5	2	4	3	2
6	5	7	6	2	5

	b)	Solve the following for player A and B and also value of game. Player B Player A A_1: 2, -1, 5, -2, 6 A_2: -2, 4, -3, 1, 0	*CO4*	*PO1,2,5*	**10**
		UNIT - V			
7	a)	A machine costs 10,000. Its operating cost and resale values are given below: Year: 1, 2, 3, 4, 5, 6, 7 Operating Cost: 1000, 1200, 1400, 1700, 2000, 2500, 3000 Resale value: 6000, 4000, 3200, 2600, 2500, 2400, 2000 Find the optimal replacement period and the minimum cost.	*CO5*	*PO1,2,5*	**08**
	b)	The probability P_n of failure just before age n is shown below. If individual replacement costs Rs. 12.50 and group replacement costs Rs. 3 per item. Find the optimal replacement policy and the minimum cost of replacement. n: 1, 2, 3, 4, 5 P_n: 0.1, 0.2, 0.25, 0.3, 0.15 Assume 1000 as the initial population.	*CO5*	*PO1,2,5*	**12**

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