U.S.N.										

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

Autonomous Institute Affiliated to VTU

May 2024 Semester End Make-Up Examinations

Programme: B.E. **Semester: VIII**
Branch: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 16ME8DCORE **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.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Define OR. Explain the characteristics of OR.	CO1	PO1	**08**
	b)	A manufacturer of a line of patent medicines is preparing a production plan on medicines A and B. There are sufficient ingredients available to make 20,000 bottles of A and 40,000 bottles of B, but there are only 45,000 bottles into which either of the medicines can be filled. Furthermore, it takes 3 hours to prepare enough material to fill 1000 bottles of A and 1 hour to prepare enough material to fill 1000 bottles of B and there are 66 hours available for this operation. The profit is Rs. 8 per bottle of A and Rs.7 per bottle of B. Formulate this problem as L.P.P to maximize the profit and solve graphically to determine the maximum profit.		PO1	**12**
		OR			
2	a)	What do you mean by degeneracy in simplex problem? How do you resolve it?	CO1	PO1	**05**
	b)	Show that there is an unbounded solution to the following LPP Max $Z = 4x_1 + x_2 + 3x_3 + 5x_4$ Subject to $4x_1 - 6x_2 - 5x_3 - 4x_4 \geq -20$ $-3x_1 - 2x_2 + 4x_3 + x_4 \leq 10$ $-8x_1 - 3x_2 + 3x_3 + 2x_4 \leq 20$ $x_1, x_2, x_3, x_4 \geq 0$	CO1	PO1	**15**

			UNIT - II				
	3	a)	Solve the following TP to determine the optimum transportation schedule.	*CO2*	*PO1*	**12**
		b)	Explain Degeneracy in Transportation problem.	*2*	*1*	**08**
			OR			
	4	a)	Four workers are available to work on four machines and the respective costs associated with each machine worker assignment is given below:	*CO2*	*PO1*	**12**
		b)	Differentiate between Transportation and Assignment problems.	*CO2*	*PO1*	**8**
			UNIT - III			
	5	a)	Solve the following game.	*CO3*	*PO1*	**10**
		b)	Players A and B play a game in which each player has three has three coins 20p, 25p and 50p. Each of them selects a coin without the knowledge of the other player. If the sum of the values of the coins is an even number, A wins B's coin. If the sum is an odd number, B wins A's coin. (i) Develop a payoff matrix with respect to player A. (ii) Find the optimal strategies for the players. What is the value of the game?	*CO3*	*PO1*	**10**

						supply
		D	E	F	G	
	A	8	10	7	6	50
	B	12	9	4	7	40
	C	9	11	10	8	30
Demand		25	32	40	23	

		MACHINE			
		M1	M2	M3	M4
Workers	W1	12	3	6	-
	W2	4	10	-	5
	W3	7	2	8	9
	W4	-	7	8	6

The sign (-) indicates that the particular worker machine assignment is not permitted. (i) Determine the optimum assignment. (ii) A fifth machine is available to replace one of the existing machines and the associated costs are W1 = 4 Rs, W2=3 Rs. W3=3Rs and W4=2 Rs. Determine whether the new machine can be accepted and if so, which machine does it replace?

		Player A strategies		
Player B strategies		I	II	III
	A	-4	6	3
	B	-3	-3	4
	C	2	-3	4

			UNIT – IV			
	6	a)	There are six jobs, each of which is to be processed through three machines A, B and C in the order CBA, processing time in hours are shown in the table below. Machines Jobs | A | B | C 1 | 8 | 3 | 8 2 | 7 | 4 | 3 3 | 6 | 5 | 7 4 | 9 | 2 | 2 5 | 10 | 1 | 5 6 | 9 | 6 | 1 Determine the optimum sequence for the five jobs and the minimum elapsed time.	*CO4*	*PO4*	**10**
		b)	Use graphical method to solve the following sequencing problem, also calculate the total time required to complete both the jobs. Job 1 | Sequence | A | B | C | D | E Time(hrs) | 2 | 3 | 4 | 6 | 2 Job 2 | Sequence | C | A | D | E | B Time(hrs) | 4 | 5 | 3 | 2 | 6	*CO4*	*PO1*	**10**
			UNIT - V			
	7	a)	The cost of a machine is Rs 6100 and its scrap value is only Rs 100. The maintenance costs are found from experience to be as follows: Years | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 Maintenance Cost (Rs) | 100 | 250 | 400 | 600 | 900 | 1250 | 1600 | 2000 When should the machine be replaced?	*CO5*	*PO1*	**10**
		b)	Find the cost per period of individual replacement policy of an installation of 300 light bulbs, given the following: Cost of replacing an individual bulb is Rs. 2 Conditional probability of failure is given below: Week No. | 0 | 1 | 2 | 3 | 4 Conditional probability of failure | 0 | 0.1 | 0.3 | 0.7 | 1.0	*CO5*	*PO1*	**10**

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