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

Autonomous Institute Affiliated to VTU

July 2023 Semester End Main Examinations

Programme: B.E.   Semester: VI
Branch: Institutional Elective   Duration: 3 hrs.
Course Code: 20IM6IEOPR   Max Marks: 100
Course: Operations Research   Date: 07.07.2023

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. Briefly discuss the phases of OR.	*CO1*	-	**08**
	b)		A manufacturer of a line of patent medicines is preparing a production plan on medicine 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 put. Furthermore, it takes 3 hours to prepare enough material to fill 1,000 bottles of A, it takes one hour to prepare enough material to fill 1,000 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. i) Formulate this problem as an LPP to maximize the profit. ii) Solve it graphically.	*CO2*	*PO2*	**12**
			OR			
2	a)		Solve the following LPP using Big M method. Minimize $Z=10x_1+15x_2+20x_3$ Subject to $2x_1+4x_2+6x_3 \geq 24$ $3x_1+9x_2+6x_3 \geq 30$ $x_1,x_2,x_3 \geq 0$	*CO2*	*PO2*	**14**
	b)		Define the following (i) Slack and surplus variable (ii) Basic feasible solution (iii) Unbounded solution	*CO2*	*PO2*	**06**
			UNIT - II			
3	a)		What is degeneracy in transportation problem? How is it resolved?	*CO1*	-	**06**

	b)	A corporation has three manufacturing plants 1,2 and 3 which can produce one or all the four different products A, B, C and D. Different variable cost at each plant result in variable unit profit as given in the table below. Determine the quantity of products that should be manufactured at each plant so that the total profit is maximised.	CO2	PO2	**14**

			PRODUCTS				
PLANTS		A	B	C	D	CAPACITY
	1	22	26	20	21	450
	2	21	24	20	19	300
	3	18	20	19	20	250
	DEMAND	200	300	150	270	

UNIT - III

4	a)	The owner of a small machine shop has four machines available to assign job for the day. Five jobs are offered with expected profit as follows:	CO3	PO3	**10**

		Jobs				
		A	B	C	D	E
Machines	I	62	78	50	111	82
	II	71	84	61	73	59
	III	87	92	111	71	81
	IV	48	64	87	77	80

Find the assignment of machines to the jobs that will result in a maximum profit.

| | | b) | A machine operator processes five types of items on his machine each week, and must choose a sequence for them. The setup cost per change depends on the item presently on the machine and the setup to be made according to the following table: | CO3 | PO3 | **10** |

		To			
		A	B	C	D	E
From	A	∞	4	7	3	4
	B	4	∞	6	3	4
	C	7	6	∞	7	5
	D	3	3	7	∞	7
	E	4	4	5	7	∞

If he processes each type of item once and only once each week, how should he sequence the items on his machine in order to minimise the total setup cost?

UNIT - IV

| 5 | a) | Consider the following data for activities in a given project. | CO4 | PO4 | **16** |

Activity	A	B	C	D	E	F	G	H	I	J
Preceding Activity	-	A	A	A	B, C,D	A	D	A	H	G
Duration (WEEKS)	3	6	4	3	1	4	5	5	1	2

i)Draw the network of the project   ii) Identify the critical path and project duration iii) Find the early and late start schedule for all activities in the project

| | b) | Differentiate between CPM and PERT | CO2 | PO2 | **04** |

OR

6	a)								CO4	PO4	14

Activity	Normal			Crash		CO4	PO4	14
	Time(days)	Cost(Rs)		Time(days)	Cost(Rs)			
1-2	8	100		6	200			
1-3	4	150		2	350			
2-4	2	50		1	90			
2-5	10	100		5	400			
3-4	5	100		1	200			
4-5	3	80		1	100			

Determine the optimum project duration and cost for the following data.
Indirect cost is Rs. 70 per day.

	b)	Describe the following i) Concurrent activities ii) Dummy activites iii) Critical path	CO2	PO2	06

UNIT - V

7	a)	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?	CO4	PO4	12

	b)	Solve the following game by using the principle of dominance	CO4	PO4	08

Player A		Player B					
		P	Q	R	S	U	V
	1	4	2	0	2	1	1
	2	4	3	1	3	2	2
	3	4	3	7	-5	1	2
	4	4	3	4	-1	2	2
	5	4	3	3	-2	2	2

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