Exam Date & Time: 09-Jan-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

OPERATIONS RESEARCH [MME 3156]

Marks: 50 **Duration: 180 mins.**

Descriptive

Answer all the questions.

1A) Solve the following LPP using graphical method. (5)

Maximize $Z=100x_1+60x_2$

Subject to:

$5x_1+10x_2 \leq 50$

$8x_1+2x_2 \geq 16$

$3x_1-2x_2 \geq 6$

$x_1, x_2 \geq 0$

1B) A manufacturer produces two types of models M_1 and M_2. Each model of the type M_1 requires 4 hours of grinding and 2 hours of polishing ; whereas each model of the type M_2 requires 2 hours of grinding and 5 hours of polishing. The manufacturer has 2 grinders and 3 polishers. Each grinder works 40 hours a week and each polisher works for 60 hours a week. Profit on M_1 is 3Rs and on model M_2 is 4Rs. Whatever is produced in a week is sold in the market. How should the manufacturer allocate his production capacity to two types of models to gain maximum profit? (3)

1C) Enumerate the assumptions of linear programming problems? (2)

2A) The assignment cost of assigning any operator to any one machine is given in the following table. Find the optimal assignment. (5)

		Operators			
		I	II	III	IV
Machine	A	10	5	13	15
	B	3	9	18	3
	C	10	7	3	2
	D	5	11	9	7

2B) Apply North-West corner method to find the best allocation and also find the transportation cost. (3)

Factory	W1	W2	W3	W4	Supply
F1	[10]	[2]	[20]	[11]	15
F2	[12]	[7]	[9]	[20]	25
F3	[4]	[14]	[16]	[18]	10
Demand	5	15	15	15	

2C) What are the properties of linear programming problems? (2)

3A) Determine the optimum solution using stepping stone method showing the appropriate steps. (5)

SOURCE	DESTINATION							
	D1		D2		D3		D4	
S1		2	5	3	1	11		8
S2		1		0		8	1	1
S3	3	5		8	6	15	1	9

3B) Graphically solve the following game and find the value of game and optimum strategies. (3)

		Player B			
Player A	I	5	2	4	6
	II	4	7	3	2

3C) Discus the elements of queuing system. (2)

4A) Draw the network for the given project and determine the following: (5)

- Critical path and duration
- Earliest start and latest finish for every event
- Float of events

Name	A	B	C	D	E	F	G	H	I	J	K
Activities Node	1–2	1–3	1–4	2–5	3–5	3–6	3–7	4–6	5–7	6–8	7–8
Duration	2	7	8	3	6	10	4	6	2	5	6

4B) How does dominance property rule help solve game theory problem? Discuss with help of an application problem (3)

4C) Illustrate project time -project cost trade off. (2)

5A) Maximize: $Z = 5x_1 + 12x_2 + 4x_3$
Subject to: $x_1 + 2x_2 + x_3 \leq 5$;
$2x_1 - x_2 + 3x_3 = 2$;
$x_1, x_2, x_3 \geq 0$. (5)
Discuss the effect of changing requirement vector from $\begin{bmatrix} 5 \\ 2 \end{bmatrix}$ to $\begin{bmatrix} 7 \\ 2 \end{bmatrix}$. Also determine the shadow price.

5B) Customers arrive to a restaurant with an interarrival time (in minutes) of 0, 10, 3, 8, 20, 4 and service time (in minutes) of 8, 7, 12, 5, 6, 3 respectively for the first six customers. Develop the simulation table for six customers and determine: (3)
Average waiting time
Average time customer spends in restaurant
Percentage of idle server

5C)	How do you distinguish the project evaluation and review technique with the critical path method. List and compare only the valid differences.	(2)

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