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GIET UNIVERSITY, GUNUPUR - 765022
M. Sc. (Third Semester) Regular Examinations, December - 2023
22MTCBOE308- Optimization Techniques
(Mathematics)

Time: 3 hrs

Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A**(2 x 10 = 20 Marks)**Q.1. Answer *ALL* questions

- | | CO # | Blooms
Level |
|--|------|-----------------|
| a. Define slack and surplus variable. | CO1 | K1 |
| b. How many types of Integer Programming Problems are there? Explain in details. | CO1 | K1 |
| c. Solve by Graphical Method.
Maximize $Z = 15x_1 + 10x_2$

Subject to the constraints
$4x_1 + 6x_2 \leq 360$
$3x_1 \leq 180$
$5x_2 \leq 200$

and
$x_1, x_2 \geq 0.$ | CO1 | K2 |
| d. Write advantages of 2-Phase method. | CO1 | K2 |
| e. Write down the steps of North-West Corner rule. | CO2 | K2 |
| f. Write the difference between Transportation problem and Assignment problem. | CO2 | K1 |
| g. What is maximin-minimax principle? | CO3 | K1 |
| h. Explain the term 'Strategy' in Game theory. | CO3 | K2 |
| i. Define different types of games. | CO3 | K1 |
| j. Define Balking and Jockeying. | CO4 | K1 |

PART – B**(10 x 5 = 50 Marks)**Answer ANY FIVE questions

- | | Marks | CO # | Blooms
Level |
|---|-------|------|-----------------|
| 2. What are the differences between simplex method and dual simplex method? | 10 | CO1 | K2 |

3. Solve the following LPP using dual simplex method: 10 CO1 K3

$$\text{Minimized } Z = X_1 + 2X_2 + 3X_3$$

Subject to

$$2X_1 - X_2 + X_3 \geq 4,$$

$$X_1 + X_2 + 2X_3 \leq 8,$$

$$X_2 - X_3 \geq 2, X_1, X_2 \text{ and } X_3 \geq 0$$

4. Solve the following assignment problem in order to minimize the total cost. 10 CO2 K2
The cost matrix given below gives the assignment cost when different operators are assigned to various machines.

		Operators				
		I	II	III	IV	V
Machines	<i>A</i>	30	25	33	35	36
	<i>B</i>	23	29	38	23	26
	<i>C</i>	30	27	22	22	22
	<i>D</i>	25	31	29	27	32
	<i>E</i>	27	29	30	24	32

5. Solve the following Transportation problem where the cell entries denote the unit transportation cost using least cost method. 10 CO2 K3

		Destination				Supply
		A	B	C	D	
Source	P	5	4	2	6	20
	Q	8	3	5	7	30
	R	5	9	4	6	50
	Demand	10	40	20	30	100

6. a. Explain Dominance property in game theory. 5 CO3 K2
b. Solve the following pay-off matrix. Also determine the optimal strategies and value of the game 5 CO3 K2

$$A \begin{matrix} & B \\ \begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix} \end{matrix}$$

- 7.a. In a railway marshalling yard, goods trains arrive at the rate of 30 trains per day. Assume that the inter-arrival time follows an exponential distribution and the service time is also to be assumed as exponential with mean of 36 minutes. Calculate, 5 CO4 K3
- (i) The probability that the yard is empty.
 - (ii) The average queue length, assuming that the line capacity of the yard is nine trains.

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|---|----|-----|----|
| b. A car park contains 5 cars. The arrival of cars is Poisson, at a mean rate of 10 per hour. The length of time each car spends in the car park is exponential distribution with mean of 0.5 hours. How many cars are in the car park on an average? | 5 | CO4 | K2 |
| 8. Write notes on Multi-Server Queuing models. | 10 | CO3 | K2 |