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GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR

(GIET UNIVERSITY)

M. Sc. (Third Semester) Regular Examinations, December – 2024

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)**

		CO #	Blooms Level
Q.1.	Answer ***ALL*** questions		
a.	Solve the following LPP by graphical method. Minimize $20x + 10y$ Subject to, $x + 2y \leq 40$ $3x + y \geq 30$ $4x + 3y \geq 60$ $x, y \geq 0$	CO1	K2
b.	Define Slack and Surplus variables.	CO1	K1
c.	Define Feasible and Basic Feasible Solution.	CO2	K1
d.	Write the algorithm for North-West corner rule.	CO2	K2
e.	State Maximin-Minimax principle in Game theory.	CO3	K1
f.	Solve the game whose pay-off matrix is given by $\begin{bmatrix} 1 & 3 & 1 \\ 0 & -4 & -3 \\ 1 & 5 & -1 \end{bmatrix}$.	CO3	K2
g.	Two players, A and B match coins match, then A wins two units of value. If coins do not match, then B wins two units of value. Determine the optimum strategies for the players and the value of the game.	CO3	K2
h.	What are the basic characteristics of a queuing system?	CO4	K1
i.	Give a short note on customer's behavior.	CO4	K1
j.	Write the steps for solving Least cost method.	CO2	K1

PART – B **(10 x 5 = 50 Marks)**

		Marks	CO #	Blooms Level
	Answer ***ANY FIVE*** questions			
2.	Solve the following problem by simplex method: Max Z=$x + y + 3p$ Subject to $3x + 2y + p \leq 3$ $2x + y + 2p \leq 2$ $x, y, p \geq 0$	10	CO1	K3
3.	Solve the following minimization problem by Dual simplex method: Min Z=$10x_1 + 6x_2 + 2x_3$ Subject to, $-x_1 + x_2 + x_3 \geq 1$ $3x_1 + x_2 - x_3 \geq 2$ $x_1, x_2, x_3 \geq 0$	10	CO1	K3

4. a. Solve the following problem by Gomory's cutting plane method: 10 CO1 K3

$$\text{Max}(z)=x_1+x_2$$

Subject to,

$$3x_1+2x_2 \le 5$$

$$x_2 \le 2$$

$$x_1, x_2 \ge 0 \text{ and are integers.}$$

5.a. Using the following cost matrix, determine 5 CO2 K2

a) optimal job assignment.
b) the cost of assignment.

Mechanic	Jobs				
	1	2	3	4	5
A	10	3	3	2	8
B	9	7	8	2	7
C	7	5	6	2	4
D	3	5	8	2	4
E	9	10	9	6	10

b. Obtain the initial basic feasible solution of a transportation problems whose cost and rim requirement table is given below. 5 CO2 K2

Origin/Destination	D_1	D_2	D_3	Supply
O_1	2	7	4	5
O_2	3	3	1	8
O_3	5	4	7	7
O_4	1	6	2	14
Demand	7	9	18	34

6. a. Solve the following 2×3 game graphically: $\begin{bmatrix} 1 & 3 & 11 \\ 8 & 5 & 2 \end{bmatrix}$. 3 CO5 K2

b. Using the principle of dominance, solve the following game: 3 CO5 K2

$$\begin{bmatrix} 3 & -2 & 4 \\ -1 & 4 & 2 \\ 2 & 2 & 6 \end{bmatrix}.$$

7. 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, 10 CO4 K2

(i) the probability that the yard is empty.
(ii) The average queue length, assuming that the line capacity of the yard is nine trains.

8. In a public telephone booth, the arrivals on an average are 15 per hour. A call on an average takes three minutes. If there is just one phone, find 10 CO4 K2

(i) The expected number of callers in the booth at any time.
(ii) The proportion of the time, the booth is expected to be idle.