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**GIET UNIVERSITY, GUNUPUR – 765022**  
M. Sc. (Third Semester) Examinations, December – 2022  
**20MTCBOE308 - 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 Quadratic Programming Problem with an example.	1	1
b. What is Branch and Bound Method?	2	2
c. What is Basic feasible solution?	1	1
d. Write Kuhn Tucker sufficient condition for non-linear programming.	3	1
e. Explain shortest route problem with an example.	4	2
f. Consider the function $f(x) = x_1 + 2x_2 + x_1x_2 - x_1^2 - x_2^2$ . Determine the maximum and minimum point of the function.	4	3
g. Define Service process or Mechanism.	4	1
h. Define Queuing Discipline.	4	1
i. Obtain the necessary conditions for the optimum solution of the following problem. Minimize $f(x_1, x_2) = 3e^{2x_1+1} + 2e^{x_2+5}$ Subject to the constraint $g(x_1, x_2) = x_1 + x_2 - 7 = 0$ and $x_1, x_2 \geq 0$ .	1	3
j. Define renegeing and jockeying.	4	1

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

	Marks	CO#	Blooms Level
2. a. Solve the following LP problem by using <b>Big-M method</b> Maximize $Z = 20X_1 + 80X_2$ Subject to $4X_1 + 6X_2 \leq 90$ $8X_1 + 6X_2 \leq 100$ $5X_1 + 4X_2 \leq 80$ $X_1, X_2 \geq 0$	10	1	3
3.a. Solve the non-linear programming problem by using Lagrange's multiplier method Maximize $Z = 5X_1 - 3X_1^2 + 6X_2 - 2X_2^2$ Subject to $2X_1 + 3X_2 = 12$	10	2	3
4. a. Solve the following LPP using dual simplex method	10	1	3

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

$$\text{Subject to } 2X_1 - X_2 + X_3 \geq 4$$

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

$$X_2 - X_3 \geq 2$$

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

- 5.a. Write the algorithm of Dual simplex method. 10 2 2
6. a. Use Beale's method for solving the quadratic programming problem 10 3 3
- $$\text{Max } Z = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$$
- Subject to:
- $$x_1 + 2x_2 \leq 2 \text{ and}$$
- $$x_1, x_2 \geq 0.$$
- 7.a. Find the optimum solution of the following constrained multivariable problem. 10 3 3
- $$\text{Minimize } Z = x_1^2 + (x_2 + 1)^2 + (x_3 - 1)^2$$
- Subject to the constraint
- $$x_1 + 5x_2 - 3x_3 = 6,$$
- $$\text{and } x_1, x_2, x_3 \geq 0$$
8. a. Write notes on Multi-server Queuing models. 10 4 2

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