

BTECH
(SEM V) THEORY EXAMINATION 2022-23
OPTIMIZATION TECHNIQUE

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

- 1. Attempt all questions in brief. 2 x 10 = 20**
- a. What is a merit function?
 - b. What is a quadratic form?
 - c. Define the infeasibility form.
 - d. Explain Methods of finding initial Basic Feasible Solutions.
 - e. What is an interval of uncertainty?
 - f. Why is the scaling of variables important?
 - g. Give the definition of genetic algorithm.
 - h. Explain the types of simulation.
 - i. Why economic load dispatch is required for power system?
 - j. Write the importance of maintenance scheduling of machines.

SECTION B

- 2. Attempt any three of the following: 10x 3 = 30**
- a. Find the maximum of the function $f(X) = 2x_1 + x_2 + 10$ subject to $g(X) = x_1 + 2x_2^2 = 3$ using the Lagrange multiplier method. Also find the effect of changing the right-hand side of the constraint on the optimum value of f .
 - b. What is simplex? Describe the simplex method of solving linear programming problem
 - c. Explain the Dichotomous search. Find the minimum of $f = x(x - 1.5)$ in the interval $(0.0, 1.00)$ to within 10% of the exact value.
 - d. Explain in detail about the basic step of CPM/PERT and advantages and disadvantages of PERT and CPM.
 - e. Briefly explain about the maintenance scheduling of motor in manufacturing industry.

SECTION C

- 3. Attempt any one part of the following: 10x 1 = 10**
- a. State the various methods available for solving a multivariable optimization problem with equality constraints.
 - b. State the Kuhn-Tucker conditions. What is a convex programming problem? What is its significance?
- 4. Attempt any one part of the following: 10x 1 = 10**
- a. Use the simplex method to solve the following LP problem.
Maximize $Z = 3x_1 + 5x_2 + 4x_3$
subject to the constraints
(i) $2x_1 + 3x_2 \leq 8$, (ii) $2x_2 + 5x_3 \leq 10$, (iii) $3x_1 + 2x_2 + 4x_3 \leq 15$
and $x_1, x_2, x_3 \geq 0$

- b. Find the initial basic feasible solution for the following transportation problem, using North-West Corner Rule method.

sources	D1	D2	D3	supply
S1	43	8	5	7
S2	4	4	2	8
S3	6	5	8	10
S4	2	6	3	15
Demand	8	10	27	

5. Attempt any one part of the following:

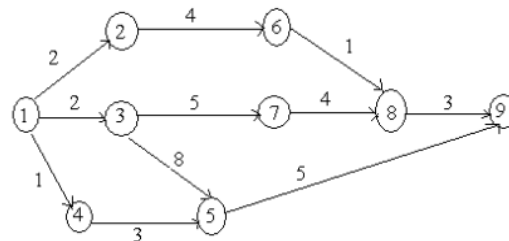
10x 1 = 10

- a. What is interval halving method? Explain its procedure to solve optimization problem with suitable example.
- b. State the necessary and sufficient conditions for the unconstrained minimum of a function. Define Unimodal function.

6. Attempt any one part of the following:

10x 1 = 10

- a. Find the critical path and calculate the slack time for the following network



- b. Write the short notes on:-
- (a) Fitness function
 - (b) genetic algorithm (GA) operator
 - (c) compare GA with traditional method

7. Attempt any one part of the following:

10x 1 = 10

- a. Consider two units of a plant that have fuel costs of

$$F_1 = 0.2P_1^2 + 40P_1 + 120 \text{Rs./h}$$

$$F_2 = 0.25P_2^2 + 30P_2 + 150 \text{Rs./h}$$

Determine the economic operating schedule and the corresponding cost of generation for the demand of 180 MW.

- b. Explain in brief about the speed control method by fuzzy logic controller.