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SUBJECT CODE NO:- H-1751
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Mechanical)
Advanced Optimization Techniques
(REVISED)

[Time: Three Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

- N.B
1. Solve any three questions from each section.
 2. Figure to right indicates full marks.
 3. Assume suitable data if required and state it clearly
 4. Use of non-programmable calculator is allowed.

Section A

- Q.1 Find the minimum of $f = X(X - 3/2)$ by starting from 0.0 with an initial step size of 0.05 using exhaustive search methods. 13
- Q.2 Minimize $f(x) = 0.65 - \left[\frac{0.75}{(1+x^2)} \right] - 0.65x \tan^{-1}(1/x)$ in the interval [0.3] by the Fibonacci method using $n=6$. 13
- Q.3 Minimize $f(X) = X_1^2 + X_2^2 + X_3^2 + 40X_1 + 20X_2$ 13
 Subject to,
 $g_1(X) = X_1 - 50 \geq 0$
 $g_2(X) = X_1 + X_2 - 100 \geq 0$
 $g_3(X) = X_1 + X_2 + X_3 - 150 \geq 0$
 Determine whether Kuhn-Tucker conditions are satisfied at the optimum point.
- Q.4 Minimize $f(X_1, X_2) = X_1 - X_2 + 2X_1^2 + 2X_1X_2 + X_2^2$ starting from the point $X_1 = \{0\}$ using Cauchy method. 13
- Q.5 Write a short note on (Any Two) 14
 a) Optimal problem formulation
 b) Optimality criteria
 c) Hessian matrix.

Section B

- Q.6 Use two phase simplex method to 13
 Maximize $Z = 3x_1 + 2x_2 + 2x_3$
 Subjected to,
 $5x_1 + 7x_2 + 4x_3 \leq 7$
 $-4x_1 + 7x_2 + 5x_3 \geq -2$
 $3x_1 + 4x_2 - 6x_3 \geq 29/7$
 $X_1, X_2, X_3 \geq 0$

Q.7 Use charms penalty methods to
 Maximize $Z = 3x_1 - x_2$
 Subjected to,
 $2x_1 + x_2 \geq 2$
 $x_1 + 3x_2 \leq 3$
 $x_1 \leq 4; x_1, x_2 \geq 0$ 13

Q.8 An aircraft company, which operates out of a central terminal, has 8 aircraft of Type –I, 15 aircraft of Type- II and 12 aircrafts of Type-III available for two days flights. The tonnage capacities (in thousands of tons) are 4.5 for Type-I, 7 for Type –II & 4 for Type-III. The company dispatches its plane to cities A and B. Tonnage requirements (in thousands of tons) are 20 at city A and 30 at city B; excess tonnage capacity supplied to a city has no value. 13

A plane can fly once only during a day. The cost of sending a plane from the terminal to each city is given by the following table.

	Type-I	Type-II	Type III
City A	23	05	1.4
City B	58	10	3.8

Formulate the model to minimize the air transportation cost.

Q.9 a) What is genetic algorithm 08
 b) Describe simulated annealing 05

Q.10 Write a short note on (Any Two) 14
 a) Global optimization
 b) Sensitivity Analysis
 c) Computer program & algorithm.