Code: 9D04201

M.Tech I Semester Regular & Supplementary Examinations February 2016

ADVANCED OPTIMIZATION TECHNIQUES

(Common to PE & PEED)

(For students admitted in 2013, 2014 & 2015 only)

Time: 3 hours Max Marks: 60

Answer any FIVE questions
All questions carry equal marks
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1 Find the optimum solution of the following function using (Big-M or 2-phase) simplex method.

Minimize $f = 9x_1 + 2x_2 + 3x_3$

Subject to $-2x_1 - x_2 + 3x_3 \leq -5$

$x_1 - 2x_2 + 2x_3 \geq -2$

$x_1, x_2, x_3 \geq 0$

2 A salesman stationed at city A has to decide his tour plan to visit cities B, C, D, E and back to city A. He should choose his path so that the total distance traveled is minimum. No sub touring is permitted. The distance between cities in kilometers is given below:

Cities	A	B	C	D	E
A	-	16	18	13	20
B	21	-	16	27	14
C	12	14	-	15	21
D	11	18	19	-	21
E	16	14	17	12	-

3 (a) What are Kuhn-Tucker conditions? What are the necessary conditions of optimality as per Kuhn-Tucker conditions?

(b) Use the Lagrange multiplier method to solve the following non-linear programming problem.

$f(x) = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$

Such that $x_1 + x_2 + x_3 = 20$

$x_1, x_2, x_3 \geq 0$

4 For the given function, complete two iterations of the steepest descent method starting from the given starting design point of (3, 1).

$f(x_1, x_2) = 25x_1^2 + 20x_2^2 - 2x_1 - x_2$

5 (a) Explain various genetic operators.

(b) Consider the following two strings denoting the vectors X_1 and X_2:

$X_1 = \{1\,0\,0\,0\,1\,0\,1\,1\,0\,1\}$; $X_2 = \{0\,1\,1\,1\,1\,1\,0\,1\,1\,0\}$;

Find the result of crossover at location 2.

6 (a) What are the steps involved in solving problems using genetic programming?

(b) How does Genetic programming differ from genetic algorithms?

7 (a) What is Pareto-optimality? Explain the basic terminology in Pareto-optimality.

(b) What are the various techniques used for solving multi-objective problems?

8 Explain the steps involved in the optimization of path synthesis of a four-bar mechanism.