Code No: **R41028** **R10** **Set No. 1**

IV B.Tech I Semester Supplementary Examinations, October/November - 2017

OPTIMIZATION TECHNIQUES

(Mechanical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1 a) Write the typical applications of optimization in the field of electrical engineering. [7]
b) What are the differences between a constraint surface and a composite constraint surface? [8]

2 a) State the Kuhn–Tucker conditions. [7]
b) Find the dimensions of a cylindrical tin (with top and bottom) made up of sheet metal to maximize its volume such that the total surface area is equal to $A_0 = 24\pi$. [8]

3 a) Define the following terms: point, hyperplane, convex set, extreme point. [7]
b) Maximize $f = 240x_1 + 104x_2 + 60x_3 + 19x_4$
Subject to $20x_1 + 9x_2 + 6x_3 + x_4 \leq 20$
$10x_1 + 4x_2 + 2x_3 + x_4 \leq 10$
$x_i \geq 0$, i = 1 to 4
Find all the basic feasible solutions of the problem and identify the optimal solution. [8]

4 How do you overcome (i) Redundancy and
(ii) Degeneration in transportation problems. [15]

5 a) What are the differences between elimination and interpolation methods? [7]
b) Find the value of x in the interval (0, 1) which minimizes the function f = x(x − 1.5) to within ±0.05 by the Fibonacci method. [8]

6 a) What are the roles of univariate and pattern moves in the Powell's method? [7]
b) Perform two iterations of the steepest descent method to minimize the function of $(x_1, x_2) = 100(x_2 - x_1^2)^2 + (1 - x_1)^2$ from the starting point $(-1.2, 1.0)^T$. [8]

7 a) Why is handling of equality constraints difficult in the penalty function methods? [7]
b) Minimize $f(x_1, x_2) = 13(x_1 + 1)^3 + x_2$
Subject to $g_1(x_1, x_2) = -x_1 + 1 \leq 0$
$g_2(x_1, x_2) = -x_2 \leq 0$ [8]

8 a) Explain the computational procedure used in dynamic programming. [7]
b) State Bellman's principle of optimality and explain by an illustrative example how it can be used to solve multistage decision problem. [8]