Code: 9D04201

M.Tech I Semester Supplementary Examinations August/September 2018

ADVANCED OPTIMIZATION TECHNIQUES

(Common to PE & PEED)

(For students admitted in 2013, 2014, 2015 & 2016 only)

Time: 3 hours Max. Marks: 60

Answer any FIVE questions

All questions carry equal marks

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1 (a) Write the procedure involved in converting inequality constraints (both≤and≥) into equality constrains in linear programming problems.

(b) Write the dual of the problem:

$Maximize\ Z = 5a - 2b$

Subject to: $2a + b \leq 9$

$a - 2b \leq 2$

$-3a + 2b \leq 3$

Where a, b, ≥ 0

2 A salesman wants to visit A, B, C, D and E. He does not want to visit any city twice before completing his work. Find the least cost route.

	A	B	C	D	E
A	-	2	5	7	1
B	6	-	3	8	2
C	8	7	-	4	7
D	12	4	6	-	5
E	1	3	2	8	-

3 Using the method of Lagrange multipliers:

$Minimize\ f(x) = \frac{1}{2}(x_1^2 + x_2^2 + x_3^2)$

Subject to: $g_1(x) = x_1 - x_2$

$g_2(x) = x_1 + x_2 + x_3 - 1$

4 Calculate the gradient of the following function at the given point by the central difference approach with a 1 percent change in the point and compare them with the exact gradient:

$f(x) = 12.096x_1^2 + 21.504x_2^2 - 1.732x_1 - x_2 at\ (5,6)$

5 (a) Write the steps involved in writing a sample genetic algorithm.

(b) Explain the Roulette wheel analogy for the reproduction procedure in genetic algorithms.

6 Explain the concept of genetic programming (GP) and write the procedure for solving differential equations using GP.

7 (a) Explain the terms population, generation and niche used in genetic algorithms.

(b) Explain the applications of multi objective GA problems.

8 A beam of rectangular cross section is subjected to a maximum bending moment of M and a maximum shear of V. The allowable bending and shearing stresses are σ and τ, respectively. The bending stress in the beam is calculated as:

$$\sigma = \frac{6M}{bd^2}$$

And average shear stress in the beam is calculated as:

$$\tau = \frac{3V}{2bd}$$

Where d is the depth and b is the width of the beam. It is also desired that the depth of the beam shall not exceed twice its width. Formulate the design problem for minimum cross-sectional area using the following data:

$M = 140kN\ m, V = 24\ kN, \sigma = 165\ MPa, \tau = 50\ MPa.$

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