BIMEE-004

B.Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

00562

December, 2017

BIMEE-004 : OPTIMIZATION TECHNIQUES IN ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **five** of the following questions. All questions carry equal marks. Assume suitable value for any missing data. Use of scientific calculator is permitted.*

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1. (a) Explain how and why optimization techniques have been valuable in aiding executive decisions. 7

   (b) Discuss the various phases in solving an optimization problem. 7

2. (a) Solve the following linear programming problem by graphical method : 8

   Maximize

   $$z = 2x_1 + 3x_2$$

   subject to constraints

   $$x_1 + x_2 \leq 1$$

   $$3x_1 + x_2 \leq 4$$

   $$x_1 + x_2 \geq 0$$

(b) Differentiate between single and multivariable optimization with suitable examples. 6

3. (a) Discuss the typical characteristics of a constrained problem. Explain direct and indirect methods in brief. 7

(b) Discuss the differences and similarities between Genetic algorithm and Traditional method. 7

4. (a) Solve the given linear programming problem by simplex method : 8

Minimize

$$z = -40x_1 - 100x_2$$

subject to

$$10x_1 + 5x_2 \leq 250$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

$$x_1, x_2 \geq 0$$

(b) Briefly describe the finite difference method applied to two-dimensional problems. 6

5. (a) Explain the concept involved in the branch and bound algorithm used for solving integer programming problems. *6*

(b) Solve the following problem using Kuhn-Tucker conditions : *8*

Maximize

$$z = 2x_1^2 - 7x_2^2 + 12x_1 \cdot x_2$$

subject to

$$2x_1 + 5x_2 \leq 98$$

$$x_1, x_2 \geq 0$$

6. (a) Briefly describe dynamic programming and its applications. *6*

(b) Find the real root of the equation

$$x^4 + x^2 - 80 = 0$$

by the Newton-Raphson method, correct to three decimal places. *8*

7. (a) Briefly describe the pure and mixed strategies in the theory of games. *6*

(b) Use dynamic programming to find the shortest path from city 1 to city 7 of the route network (distance between the cities are given in kilometres) as shown in Figure 1. *8*

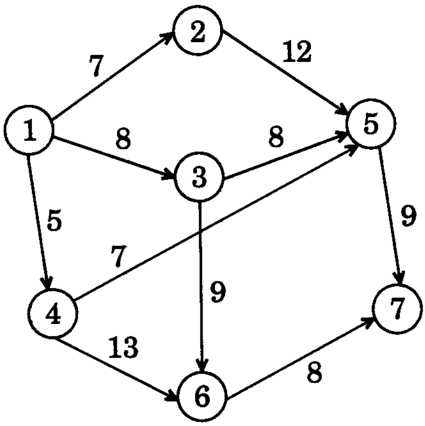

Figure 1

8. Write short notes on any ***four*** of the following: $4\times3\frac{1}{2}=14$

(a) Transhipment Problems

(b) Cutting Plane Methods

(c) Online RealTime Optimization

(d) Optimization in Econometric Approaches

(e) Goal Programming

(f) Discrete Simulation