

**B.Tech. MECHANICAL ENGINEERING  
(BTMEVI)**

**Term-End Examination**

**December, 2013**

**BIMEE-004 : OPTIMIZATION TECHNIQUES IN  
ENGINEERING**

*Time : 3 hours*

*Maximum Marks : 70*

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

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1. Attempt *any two* parts : 7x2=14
- (a) What is optimization ? Give engineering application of optimization with suitable example.
  - (b) What is graphical optimization ? Mention its limitations.
  - (c) Explain the following with suitable examples :
    - (i) Objective Function
    - (ii) Constraints
    - (iii) Merit Function
2. Write short notes on *any two* of the following : 7x2=14
- (a) Genetic algorithm and Genetic Programming.
  - (b) Jacobi's Iteration Method.
  - (c) Optimization Multivariable Function.
  - (d) Sequential Quadratic Programming.

3. Describe Lagrange - multiplier method. Solve the following problem : 14  
 Maximize :  $x^3y^5$   
 Subject to :  $x + y = 8$
4. (a) State the principle of Optimality in dynamic programming. 7  
 (b) Distinguish between linear programming and dynamic programming. What types of problems can be solved by dynamic programming ? 7
5. Find the optimum solution to the following transportation problem in which cells contain the transportation cost in Rs. 14

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	D <sub>6</sub>	Available
O <sub>1</sub>	2	1	3	3	2	5	50
O <sub>2</sub>	3	2	2	4	3	4	40
O <sub>3</sub>	3	5	4	2	4	1	60
O <sub>4</sub>	4	2	2	1	2	2	30
Required	30	50	20	40	30	10	180

6. Minimize :  $f(\bar{x}) = x_1^2 + x_2^2 + x_3^2$  14  
 subject to :  $x_1 + 2x_2 + 3x_3 = 7$   
 $2x_1 + 2x_2 + x_3 = \frac{9}{2}$
7. Obtain the solution of necessary conditions for the following non-linear programming problem : 14  
 Maximize :  $Z = 4x_1 - 0.1x_1^2 + 5x_2 - 0.2x_2^2$   
 subject to :  $x_1 + 2x_2 = 40$ .