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BIMEE-004

B.Tech. MECHANICAL ENGINEERING (BTMEVI)

00690

Term-End Examination

June, 2013

BIMEE-004 : OPTIMISATION TECHNIQUES IN ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note: Answer ***any five*** *of the following questions. Each question carries* ***equal*** *marks. Assume a suitable value for any missing data.*

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1. (a) Determine the maximum and minimum values of the following function : 7

$f(x) = 24x^5 - 90x^4 + 80x^3 + 10$

(b) Find the maximum and minimum of the following function : 7

$$f(x_1, x_2, x_3) = x_1^2 - 12x_1 + x_2^2 - 8x_2 + x_3^2 - 4x_3$$

2. (a) Minimise 7

$$Z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$$

Subject to :

$x_1 + x_2 + x_3 = 20$

$x_1, x_2, x_3 \geq 0$

(b) State the necessary and sufficient conditions for the maximum of a multivariable function $f(x)$. 7

3. (a) Minimize $z = x_1^2 + x_2^2 + x_3^2$ 7

Subject to :

$x_1 + x_2 + 3x_3 = 2$

$5x_1 + 2x_2 + x_3 = 5$

$x_1, x_2, x_3 \geqslant 0$

(b) Find the dimensions of a rectangular parallelopiped with largest volume whose sides are parallel to the coordinate planes to be inscribed in the ellipsoid : 7

$$g(x, y, z) \equiv \frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} - 1 = 0.$$

4. (a) Explain the procedure of Branch and Bound method using a suitable example. 7

(b) Distinguish between Newton and quasi-Newton methods. 7

5. Using MODI method find the optimum solution of the following transportation problem : 14

	D_1	D_2	D_3	D_4	Supply
S_1	21	16	25	13	11
S_2	17	18	14	23	13
S_3	32	27	18	41	19
Demand	6	10	12	15	

6. (a) With the help of a suitable example, explain the Minimax and Maximin Algorithm for decision making. 7

(b) Explain the procedure for the solution of an Integer Programming Problem by cutting plane methods. 7

7. Write short notes on **any two** of the following :

(a) Genetic Algorithms **2x7=14**

(b) Discrete Simulation

(c) Heuristic Methods

(d) Constrained optimization