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BIMEE-004

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

Term-End Examination

December, 2016

00933

BIMEE-004 : OPTIMIZATION TECHNIQUES IN ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

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1. A pharmaceutical company has 100 kg of chemical A, 180 kg of B and 120 kg of C available per month. They can use these chemicals to make three pharmaceutical products, namely, 5-10-5, 5-5-10 and 20-5-10, where the numbers in each case represent the percentage by weight of A, B and C respectively in each of the products. The cost of these raw materials are given below :

Ingredient	Cost per kg (₹)
A	80
B	20
C	50
Inert Ingredients	20

Selling prices of the three products are ₹ 40·50, ₹ 43 and ₹ 45 per kg respectively. There is a capacity restriction of the company for the product 5-10-5, as they cannot produce more than 80 kg per month. Determine how much of each of the products they should produce in order to maximize their monthly profit. *14*

2. (a) Explain the direct search method for optimizing multivariable function with equality constraint using a suitable example. *7*

   (b) Describe the iterative procedure for the solution of a quadratic programming problem by Wolfe's modified simplex method. *7*

3. Using stepping-stone method, find the optimum solution for the following transportation problem : *14*

Distribution Centres

Sources	D_1	D_2	D_3	D_4	Supply
S_1	2	3	11	7	6
S_2	1	0	6	1	2
S_3	5	8	15	9	10
Requirements	7	5	3	2	–

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

(b) A length of wire, 1 m long, is to be divided into two pieces, one in a circular shape and the other into a square, having radius 'r' and of side 'b' respectively. Find the individual length so that the total area is minimum. 7

5. (a) Evaluate $\int_0^9 \frac{dx}{1+x^2}$ by using

(i) Simpson's $\frac{1}{3}$ rule, and

(ii) Simpson's $\frac{3}{8}$ rule. 7

(b) Using Newton-Raphson method, find the real root of the equation $3x = \cos x + 1$. 7

6. (a) What is dynamic programming ? What types of optimization problems can be solved by dynamic programming ? Explain. 7

(b) Differentiate between constrained and unconstrained problems with the help of examples. 7

7. Write short notes on any ***two*** of the following : *2×7=14*

(a) Integer Programming

(b) Stochastic Programming

(c) Genetic Algorithms