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ME-581 OPTIMIZATION TECHNIQUES IN DESIGN   (M.Tech 1ˢᵗ sem)

Time: 03 Hrs.   Max. Marks : 100

Answer any five question, each carry equal marks

1. (a) What steps would you take to make a design simple?
   (b) Explain design vector and design constraints with help of suitable example.

2. A company manufactures goods for a market in which the technology of the products is changing rapidly. The R & D department produced a new product which appears to have potential for commercial exploitation. A further Rs. 60000/- is required for development. As a result of previous experience of this type of market, it has been possible to derive a probability distribution relating to the proportions of the customers who will buy the product as follows:

Probability of customers	0.04	0.08	0.12	0.16	0.20
Probability	0.1	0.1	0.2	0.4	0.2

   Determine the expected opportunity losses, given no other information than that stated above and state whether or not the company should develop the product.

3. (a) Find the maximum of the function
$$f(x) = (2x_1 + x_2 + 10)$$
$$Subject\ to\ g(x) = x_1 + 2x_2^2 = 3$$
   Using Lagrange's Multiplier method, also find the effect of changing the right hand side of the constraint on the optimum value of f.
   (b) Find the extreme point of the function
$$f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$$

4. Solve Graphically the following NLPP:-

$$Z_{max} = 2x_1 + 3x_2$$

   Subject to constraints $x_1, x_2 \le 8,\ x_1^2 + x_2^2 \le 20,\ x_1, x_2 \ge 0$

   Verify that the Kuhn-Tucker conditions holds for the Maxima you obtain.

5. State Kuhn-Tucker conditions , use them to minimize

$$f(x, y,\ z) = x^2 + y^2 + z^2 + 20\,x + 10\,y$$

   Subject to $x \ge 0,\ x + y \ge 80,\ x + y + z \ge 120$

6. Write about (Any Two)
   (i)   Genetic Algorithm and its field of application
   (ii)   Neural – Network in design
   (iii)   Process Simulation
   (iv)   Monte-Carlo simulation