SEAT No. :

[Total No. of Pages : 2

[4760]-1070

M.E. (Mechanical Design Engineering)
OPTIMIZATION TECHNIQUES
(2013 Pattern) (Semester - III)

Time : 3 Hours]   *[Max. Marks : 50*

Instructions to the candidates:
  1) *Answer any five questions.*
  2) *Neat diagrams must be drawn wherever necessary.*
  3) *Figures to the right side indicate full marks.*
  4) *All questions carry equal marks.*
  5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator is allowed.*
  6) *Assume suitable data if necessary.*

SECTION - I

Q1) a) What is the meaning of optimization? What are the different mathematical techniques for dealing optimization problems?   **[6]**

   b) Describe the following :   **[4]**
       i)   Design constraints.
       ii)   Design Vector.

Q2) a) What is a convex set and non-convex set?   **[4]**

   b) A manufacturer produces two types of machine parts P_1 and P_2, using lathes and milling machines. The machining times required by each part on the lathe and the milling machine are given below :

M/c Part	Machine Time (hr) required by each unit on		Profit per unit
	Lathe M/c	Milling M/c	
P_1	5	2	Rs. 200
P_2	4	4	Rs. 300

If the total machining time available in a week are 500 hours on lathe and 400 hours on milling machines, determine the total number of units of P_1 and P_2 are to be produced per week so as to maximize the profit. **[6]**

Q3) a) Find the value of x in the interval [0, 3] using golden section method upto six iterations. **[6]**

$$F(x) = 0.65 - [0.75 / (1 + x^2)] - 0.65 \times x \times \tan^{-1}\left(\frac{1}{x}\right).$$

b) What are the advantages of Powell's method? **[4]**

SECTION - II

Q4) a) Write in brief the important stages in genetic algorithm. **[5]**

b) Write in brief the analogy used in simulated annealing method. **[5]**

Q5) a) Minimize the function $F(x) = x \times (x - 1.5)$ using Newton-Raphson method with a starting point $x_1 = 1.0$. **[5]**

b) What do you mean by topology optimization? Explain with a suitable example. **[5]**

Q6) a) Write the flow chart of the BESO (Bidirectional Evolutionary Structural Optimization) Method. **[6]**

b) Write a short note on : **[4]**

i) Neural network.

ii) Fuzzy optimization.

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