Total No. of Questions : 7]

P4587

SEAT No. :

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[4860] - 1071

M.E. (Mechanical-Design Engineering)

OPTIMIZATION TECHNIQUES

(2013 Credit Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and stream table is allowed.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

Q1) a) Define Optimization. What are applications of optimization in engineering? **[6]**

b) Describe following (any two) **[4]**

i) Objective function

ii) Constraint surface

iii) Design Vector

Q2) a) Minimize $f(x)=(x_1^2 + x_2^2 + x_3^2)/2$ subjected to $g_1(x)=x_1 - x_2 = 0$ and $g_2(x)= x_1 + x_2 + x_3 = 0$ by direct substitution method. **[5]**

b) Determine the maximum and minimum values of the function $f(x)=12x^5 - 45x^4 + 40x^3 + 5$ **[5]**

Q3) a) Solve following LPP by simplex method **[10]**

Maximize $Z = 4000x_1 + 2000x_2 + 5000x_3$

Subjected to $12x_1 + 7x_2 + 9x_3 \leq 1260$

$22x_1 + 18x_2 + 16x_3 \leq 19008$

$2x_1 + 4x_2 + 3x_3 \leq 396$

And $x_1, x_2, x_3 \geq 0$

Q4) a) Write a note on following (any one) **[5]**

i) Golden section method

ii) Powells method of optimization

b) Find the minimum of $F(x)=x(x - 1.5)$ in the interval of (0.00, 1.00) to within 10% of the exact value using exhaustive search method. **[5]**

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Q5) a) Explain simulated annealing optimization and state its advantages. **[5]**

b) Write a note on following (any two) **[5]**

i) Genetic algorithm

ii) Artificial neural network

iii) Fuzzy Optimization

Q6) a) What is Topology optimization? Explain with suitable example. **[5]**

b) What are the various steps in optimality criteria method for finding the optimal topology of structure with isotropic material? **[5]**

Q7) Explain following (any two) **[10]**

a) Bi-Directional evolutionary optimization method

b) ESO for stress level optimization

c) ESO for stiffness optimization

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