Seat No.: _____ Enrollment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER VIII– • EXAMINATION – SUMMER-2015

Subject code: 182605 **Date: 13/05/2015**

Subject Name: Rubber Process & Product Computer Aided Design

Time: 10.30am-01.00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q. 1 Answer the following.

(a) Write the scope of optimization. **(04)**

(b) Write the advantages and disadvantages of Newton's method. **(04)**

(c) What are the essential features of optimization problems? **(03)**

(d) Write the necessary and sufficient conditions for extremum of an unconstrained function. **(03)**

Q. 2 (a) Discuss the procedure for solving the optimization problems. **(07)**

Q. 2 (b) Minimize the function of $f(X) = X^4 – X+1$ by using Newton's method. **(07)**

OR

(b) Maximize the function of $F(X) = X^2 - 6X + 3$ by using Newton's method. **(07)**

Q. 3 (a) Apply the one dimensional search technique to reduce the interval of uncertainty for maximum of the function $F = 6.64 + 1.2X – X^2$ from (0, 1) interval to less than 2 percent of its original size. Solve by golden section method. **(07)**

(b) Describe the obstacles to solution of optimization problems. **(07)**

OR

Q. 3 (a) Minimize the function $F = X^4 – 20X^3 + 0.1X$, interval (0, 1) by using fibonacci method. **(07)**

(b) Give the classification of theoretically and empirical base mathematical model. **(03)**

(c) Draw the flow chart of model building application. **(04)**

Q. 4 (a) NR base rubber batch rheological properties is mention below, maximize the cure rate function in terms of ML, MH and TC90 by using linear simplex method. **(07)**

Batch no.	TC90 (sec)	ML (kg/cm)	MH (kg/cm)	Cure rate (sec^{-1})
1	422	1.10	5.51	17.82
2	482	0.96	5.65	18.66
3	555	1.24	6.07	14.71
Actual data	800	1.35	6.00	

(b) Based on Least square method Fit the model $y=\beta 0+\beta 1x$ to the following data. Where y is the measured response and x is the dependent variable. **(07)**

x	20	55	60	34	26
y	10	24	32	16	09

OR

Q. 4 (a) If the optimization problem is to minimize objective function $y = 4x_1 - 3x_2$ subject to the constraints, **(07)**

$x_1 - 3x_2 \leq 4$

$2x_1 + 4x_2 \leq 15$

$-x_1 + x_2 \leq 6$

$x_1, x_2 \geq 0$

Find the optimum values of x_1, x_2 and y.

(b) Are the following functions convex or Strictly convex? Why? **(07)**

$2x_1^2+2x_1x_2+3x_2^2+7x_1+8x_2+25$

What are the optimum value of x_1 and x_2?

Q. 5 (a) Write algorithm steps for simple GA for optimization and explain its working with flow chart. **(07)**

(b) Define the term Artificial Neural Network (ANN). Explain its application in rubber industry with suitable example. **(07)**

OR

Q. 5 (a) Write the merits and demerits of Finite Element analysis method. **(07)**

(b) Explain the Network training and Modes of training in ANN. **(07)**

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