

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER III (OLD) – • EXAMINATION – SUMMER 2016

Subject Code: 730801

Date:03/05/2016

Subject Name: Engineering Optimization

Time:10:30 am to 01:00 pm

Total Marks: 70

Instructions:

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

- Q.1 (a) Explain the classification of optimization problems. 07
 (b) A manufacturing firm produces two products, A and B, using two limited resources. The maximum amounts of resources 1 and 2 available per day are 1000 and 250 unit, respectively. The production of 1 unit of product A requires 1 unit of resource 1 and 0.2 unit of resource 2, and the production of 1 unit of product B requires 0.5 unit of resource 1 and 0.5 unit of resource 2. The unit costs of resources 1 and 2 are given by the relations $(0.375 - 0.00005 u_1)$ and $(0.75 - 0.0001 u_2)$, respectively, where u_i denotes the number of units of resource i used ($i=1,2$). The selling prices per unit of products A and B, p_A and p_B , are given by $p_A = 2.00 - 0.0005x_A - 0.00015x_B$; $p_B = 3.50 - 0.0002x_A - 0.0015x_B$ where x_A and x_B indicate, respectively, the number of units of products A and B sold. Formulate the problem of maximizing the profit assuming that the firm can sell all the units it manufactures. 07
- Q.2 (a) Explain the difference between Elimination and Interpolation methods of Optimization. 07
 (b) Define the terms Design variables and Pre-assigned parameters and differentiate them. 07
- OR**
- (b) State the necessary and sufficient conditions for the maximum of a Multivariable and Multi objective function with illustrative example. 07
- Q.3 (a) Explain Interval halving method. 07
 (b) Find the minimum of $f(x) = x(x - 1.5)$ in the interval (0.0, 1.00) to within 10 % of the exact value. The ratio of final to initial intervals of uncertainty is given by $\frac{L_n}{L_0} = \frac{1}{2^{n/2}} + \frac{\delta}{L_0} \left(1 - \frac{1}{2^{n/2}}\right)$, where δ is a small quantity, say 0.001, and n is the number of experiments. If the middle point of the final interval is taken as the optimum point, the requirement can be stated as $\frac{1}{2} \frac{L_n}{L_0} \leq \frac{1}{10}$. 07
- OR**
- Q.3 (a) State Kuhn-Tucker conditions giving a suitable example. 07
 (b) Explain Fibonacci method. 07
- Q.4 (a) Explain Generalized Reduced Gradient Method of optimization with its significance. 07
 (b) Explain exterior penalty function method of optimization. 07
- OR**
- Q.4 (a) Explain the Characteristics of Geometric Programming Method of Optimization 07
 (b) What is Multi Objective Optimization? Explain any two methods of the same. 07

- Q.5** (a) What is Genetic Algorithm? Explain Representation of Design Variable, Objective function, Constraints and Genetic Operator in GA. **07**
- (b) Explain MATLAB Functions for Solving Optimization Problems in MATLAB Optimization Toolbox. **07**

OR

- Q.5** (a) Discuss complementary Geometric Programming and explain degree of difficulty. **07**
- (b) Stating working principle of genetic algorithms, explain three operators of the same. **07**
