

End Semester Examinations - 2015-16 Even Semester - May 2016

14CE3003 Structural Optimization

Set A

Time : 3 hrs
Total Marks: 100

1.

a. Explain with suitable examples i) Objective function ii) Constraints iii) decision variable
(15)

b. A concrete construction project requires 600 weight units of aggregate having percentage of gravel greater than 55% and less than 70% by weight. Three potential borrow areas have identified and the details are given below:

Borrow area (Source)	Gravel Content(%)	Content (%)	Max quality available in weight units	Cost per weight unit (Rs)
A.	55	45	400	30
B	90	10	450	40
C	30	70	200	20

Formulate a model with objective function and constraint (5)

OR

2. a. Solve the dual of the following problem using simplex method (17)

Minimize

$$Z = 4x_1 + 3x_2 + 6x_3$$

subject to

$$x_1 + x_3 \geq 2$$

$$x_2 + x_3 \geq 5$$

$$x_1, x_2, x_3 \geq 0$$

b. Write the general form of statement of an optimization problem (3)

3. a. Solve the following Simplex problem by Charles penalty Method (17)

Minimize

$$Z = 3x_1 + 2x_2 + 3x_3$$

Subject to

$$2x_1 + x_2 + x_3 \leq 2$$

$$3x_1 + 4x_2 + 2x_3 \geq 8$$

$$x_1, x_2, x_3 \geq 0$$

- b. Briefly explain the classification of optimization problem (3)

OR

4. a. List the names of any four one dimensional non linear methods of optimization and briefly explain any one ? (5)
- b. Determine the minimum of the function $f(x) = (x-1)(x-2)(x-3)$ using golden section method in the interval (1,3) ? (15)

5. a) Use the dynamic programming to solve linear programming problem (14)

$$\text{Maximize } z = 3x_1 + 5x_2$$

$$x_1 \leq 4$$

$$x_2 \leq 6$$

$$3x_1 + 2x_2 \leq 18$$

$$x_1, x_2 \geq 0$$

- b) Define the following terms: (6)

- i) Principal of optimality
- ii) Stage and state

OR

6. Solve the following Geometric programming problem (20)

$$\text{Minimize } f(x) = 20 x_1 x_3 + 40 x_2 x_3 + 80 x_1 x_2$$

Subject to the constraint

$$8 x_1^{-1} x_2^{-1} x_3^{-1} \leq 1$$

$$x_1, x_2, x_3 \geq 0$$

7. a. Explain the concept of a simple genetic algorithm (5)
- b. Taking a three bar truss explain in steps how the genetic algorithm works for design optimization problem (15)

OR

8. Write an account on the ant colony optimization and the steps involved in it? (20)

9. a) Explain fuzzy propositions, fuzzy inference, fuzzy rule based system and defuzzification in fuzzy set theory? (15)

b) Give the properties of fuzzy set ?

(5)

Wishing you All the Best
