00311

B.TECH. CIVIL ENGINEERING

(BTCLEVI)

Term-End Examination

December, 2013

BICEE-004 : STRUCTURAL OPTIMISATION

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any five** questions. Each question carries **equal** marks. Assume any missing data. Use of calculator is **allowed**.*

1.	(a)	Define a convex set and prove that the feasible region of a linear programming is a convex set.	**7**
	(b)	Write down the standard form (Scalar and matrix forms both) of a linear programming problem.	**4**
	(c)	What is the use of artificial variables in a linear programming problem ?	**3**
2.	(a)	State any four engineering applications of optimization.	**4**
	(b)	A company manufactures two products A and B. It is estimated that sales of product A for the next month will not exceed 15 units. The sales of product B have not been estimated but the company does have a contract to supply at least five units to a regular customer. Machine hours available	**10**

for the next month are 115 and products A and B take 4 hours and 5 hours per unit respectively. The labour hours are 180 and each unit of products A and B takes 9 hours and 6 hours respectively. The profit per unit of two products is Rs. 700 and Rs. 500 respectively. Formulate an linear programming model and determine the units of products A and B to be produced to maximize the profit.

3. (a) What is the basic idea used in the method of constrained variation ? **4**

(b) A beam of uniform rectangular cross section is to be cut from a log having a circular cross section of diameter 2a. The beam has to be used a cantilever beam (the length is fixed) to carry a concentrated load at the free end. Find the dimensions of the beam that correspond to the maximum tensile (bending) stress carrying capacity. Use the method of constrained variation. **10**

4. (a) Convert an equality constrained problem into an equivalent constrained problem. **7**

(b) State and describe kuhn-Tucker conditions. **7**

5. (a) What are the limitations of classical method of optimization in solving a one dimensional minimization problem ? **4**

(b) Define Fibonacci numbers. 3

(c) Compare Fibonacci and Dichotomous search methods. 7

6. (a) What is a arithmetic-geometric inequality ? 4

(b) Formulate the problem of determining the cross-sectional dimensions of the cantilever beam show in Fig. : 1 for minimum weight using geometric programming. The maximum possible bending stress is σ_y. 10

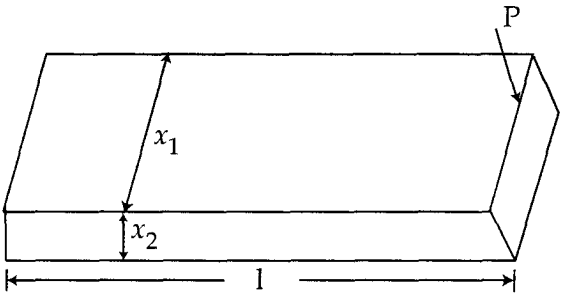

Fig : 1 : Cantilever beam of rectangular cross- section.

7. (a) What is a multistage decision problem ? 3

(b) State any two engineering examples of serial system that can be solved by dynamic programming. 4

(c) Describe a serial multistage decision process in dynamic programming using suitable mathematical expression. 7