

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

December, 2017

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**BICEE-021 : COMPUTATIONAL METHODS IN
STRUCTURAL ENGINEERING**

Time : 3 hours

Maximum Marks : 70

Note : Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted.

1. (a) Discuss the main differences between displacement and force methods of structural analysis. 7
(b) Why are flexibility and stiffness methods called as force and displacement methods respectively ? 7
2. Analyze the beam shown in Figure 1 below, by moment distribution method and draw shear force and bending moment diagrams : 14

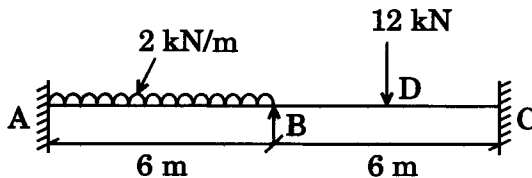


Figure 1

3. (a) What do you mean by Geometric programming ? State the general mathematical form of geometric programming. 6

- (b) Convert the following primal linear programming into dual form : 8

$$\text{Minimize } z = 3x_1 - 2x_2 + 4x_3$$

Subject to,

$$3x_1 + 5x_2 + 4x_3 \geq 7$$

$$6x_1 + x_2 + 3x_3 \geq 4$$

$$7x_1 - 2x_2 - x_3 \leq 10$$

$$x_1 - 2x_2 + 5x_3 \geq 3$$

$$4x_1 + 7x_2 - 2x_3 \geq 2$$

4. (a) What is a Perfect Frame ? How does it differ from an imperfect frame ? 4

- (b) Solve the frame by method of sections (as shown in Figure 2). 10

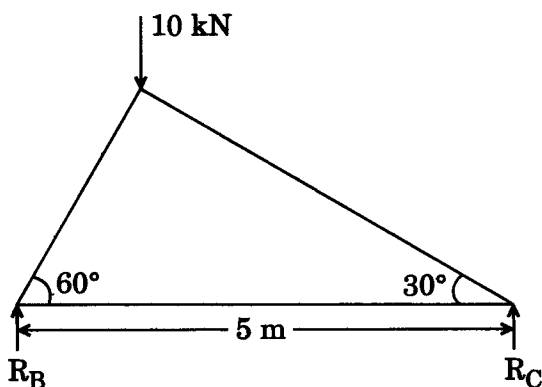


Figure 2

5. Solve the following all integer programming problem using the branch and bound method : 14

$$\text{Maximize } z = 2x_1 + 3x_2$$

Subject to,

$$6x_1 + 5x_2 \leq 25$$

$$x_1 + 3x_2 \leq 10$$

$$x_1, x_2 \geq 0 \text{ and integers.}$$

6. (a) State and explain the concept of Gauss elimination method. 7

- (b) Explain Matrix Method for Skeletal Structural Analysis in brief. 7

7. Write short notes on any *two* of the following : 2×7=14

- (a) Exterior and Interior Penalty Functions
(b) Concave Function in Optimization
(c) Shape Function in Finite Element Method
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