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BICEE-021

B.TECH. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

December, 2013

BICEE-021 : COMPUTATIONAL METHODS IN STRUCTURAL ENGINEERING

Time : 3 hours *Maximum Marks : 70*

*Note : (i) Answer **any five** questions.*

*(ii) All questions carry **equal** marks.*

*(iii) Use of **scientific** calculator is **permitted**.*

1. Locate the stationary points of f(x) and find out if the function is convex, concave or neither at the points of optima based on testing rules. **14**

$$f(x) = \frac{2x_1^3}{3} - 2x_1x_2 - 5x_1 + 2x_2^2 + 4x_2 + 5$$

2. Minimize $f = x_1^2 + 2x_2^2 + 3x_3^2$ subject to the constraints **14**

$g_1 = x_1 - x_2 - 2x_3 < 12$

$g_2 = x_1 + 2x_2 - 3x_3 \leq 8$

using KUHN-TUCKER conditions

3. Transform the general form of a linear programming problem given below to its standard form **14**

Minimize $Z = -3x_1 - 5x_2$

subject to $2x_1 - 3x_2 \leq 15$

$x_1 + x_2 \leq 3$
$4x_1 + x_2 \geq 2$
$x_1 \geq 0$
x_2 unrestricted

4. Discuss in detail the procedure for solving the integer linear programming. **14**

5. (a) Discuss the convergence requirements for solving any problem by finite element method. **7**
   (b) Briefly summarize the steps for solving any problem by FEM analysis. **7**

6. Solve the following system of equations by CHOLESKEY'S method. **14**
$3x_1 + 2x_2 - x_3 = 2$
$2x_1 + 4x_2 + 2x_3 = 1$
$-x_1 + 2x_2 + 4x_3 = 2$

7. Analyse the portal frame shown in fig by force method. **14**