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BICEE-021

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

December, 2015

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 calculator is permitted.*

1. (a) Compare the utility and advantages of Cholesky and LDLT decomposition in Matrix method for structural analysis. *10*

(b) Write a short note on Numerical integration in two-dimensional problems. *4*

2. Solve the following set of equations by Gauss elimination method :

$$2x + y - z = 1$$

$$5x + 2y + 2z = -4$$

$$3x + y + z = 5$$

Check your answers by substituting them into the original equations. *14*

3. Differentiate between the local and global optimisation. And discuss the role of convex functions in the local and global optimisations. *14*

4. What is meant by sizing optimisation ? Take up a truss and explain with a neat sketch, how a sizing structural optimisation problem can be solved in that by optimizing the cross-sectional areas of the truss members. *14*

5. Prove that $x^* = (1, 1/2, -1)$ is optimal for the optimisation problem. *14*

Minimize : $(1/2)\, x^T Px + q^T x + r$

subject to : $-1 \le x_i \le 1,\ i = 1, 2, 3$

where,

$$P = \begin{bmatrix} 13 & 12 & -2 \\ 12 & 17 & 6 \\ -2 & 6 & 12 \end{bmatrix}$$

$$q = \begin{bmatrix} -22{\cdot}0 \\ -14{\cdot}5 \\ -13{\cdot}0 \end{bmatrix} \quad \& \quad r = 1.$$

6. (a) Discuss in brief the application of penalty function method of constrained optimisation. *7*

(b) Discuss the basic properties of concave function. *7*

7. Consider the linear programming problem :

Maximize : $f(x, y) = 6x + 8y$

subject to :

$5x + 2y \leq 40$

$6x + 6y \leq 60$

$2x + 4y \leq 32$

$x \geq 0$

$y \geq 0$

Obtain the solution using the simplex method. *14*