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BICE-022

B.Tech. CIVIL ENGINEERING (BTCLEVI)
Term-End Examination

01115 **December, 2014**

BICE-022 : COMPUTER APPLICATIONS IN CIVIL ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Non-programmable calculators are allowed.*

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1. (a) Explain briefly the three approaches used in error analysis. *5*

(b) Find the round off error in storing the number 752·6835 using a four digit mantissa. *5*

2. (a) Explain the principles of false position method. *5*

(b) Find the root of the equation $f(x) = x^2 - 3x + 2$ in the vicinity of $x = 0$, using Newton-Raphson method. *5*

3. (a) Explain III-conditioned system of equation. *4*

(b) Obtain the solution of the following system using the Jacobi iteration method *6*

$$2x_1 + x_2 + x_3 = 5$$

$$3x_1 + 5x_2 + 2x_3 = 15$$

$$2x_1 + x_2 + 4x_3 = 8$$

4. (a) Describe the implementation of Jacobi's method of finding eigenvalue with the help of a flowchart. *4*

(b) Find the largest eigenvalue and the corresponding eigenvector of the matrix using power method. *6*

$$\begin{bmatrix} -1 & 0 & 0 \\ 1 & -2 & 3 \\ 0 & 2 & -3 \end{bmatrix}$$

5. (a) Describe the term 'Cubic Splines'. *3*

(b) Given below is a table of data for log x. Estimate Log 2·5 using second order Newton Interpolation. *7*

i	0	1	2	3
x_i	1	2	3	4
log x_i	0	0·3010	0·4771	0·6021

6. Evaluate the following integral for the intervals

(a) (1, 2)

(b) (1, 1·5)

using Trapezoidal rule.

$$I = \int_a^b (x^3 + 1)\, dx. \qquad 2\times5=10$$

7. (a) Explain in brief, 'Taylor's Method'. *4*

(b) Given the equation, *6*

$$\frac{dy}{dx} = 3x^2 + 1, \text{ with } y(1) = 2$$

Estimate y(2) by Euler's method using h = 0·5 and 0·25.

8. (a) Describe the fourth-order Runge-Kutta method in brief. *3*

(b) Use Runge-Kutta Method to estimate y (0·4) when *7*

$$\frac{dy}{dx} = x^2 + y^2 \text{ with } y(0) = 0$$

9. (a) Describe objective function and design constraints for the following engineering applications of optimisation : *5*

(i) Design of bridge

(ii) Design of water resource system

(b) Write down the scalar form of linear programming problem. *2*

(c) What is Golden-Section method in optimisation ? *3*

10. An entrepreneur is interested in manufacturing two types of fan blades. These blades require Forging, Forming and Painting. The detailed information are given below in the tabular form :

Operation	Blade (Type-I) in Hours	Blade (Type-II) in Hours	Available Hours Weekly	Total Capacity Weekly Hours
Forging	1	2	60	50
Forming	0·1	1·2	48	70
Painting	0·5	0·75	75	100

Formulate the above problem into a linear programming problem to maximize total profit. *10*