00161

# DIPLOMA IN COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

## Term-End Examination

## December, 2012

## BICS-033 : NUMERICAL METHODS AND COMPUTATION

*Time : 2 hours* *Maximum Marks : 70*

***Note :*** *Attempt* ***Any Five*** *Questions. Question No.* ***1*** *is* ***Compulsory.*** *Calculator is allowed.*

**1.** (a) The Newton-Raphson method fails when : **7x2=14**

(i) $f'(x)$ is negative

(ii) $f'(x)$ is too large

(iii) $f'(x)$ is zero

(iv) Never fails

(b) Relation between E and $\Delta$ is :

(i) $E = 1 + \Delta$ (ii) $E = 1 - \Delta$

(iii) $E = \Delta - 1$ (iv) None of these

(c) The relation between E, $\Delta$ and $\nabla$ is :

(i) $\Delta = E \cdot \nabla$ (ii) $E = \nabla - \Delta$

(iii) $\Delta = \frac{E}{\nabla}$ (iv) None of these

(d) If a number is rounded to k decimal places, then the absolute error is :

(i) $\frac{1}{2}\ 10^{k-1}$

(ii) $\frac{1}{2}10^{-k}$

(iii) $\frac{1}{3}10^{k}$

(iv) $\frac{1}{4}10^{-k}$

(e) Any solution to a L.P.P which satisfies the non-negativity restriction of the problem is called its _____.

(f) Interpolation is the technique of estimating the value of a function for any _____.

(g) Whenever Trapezoidal rule is applicable, Simpson's 1/3rd rule can be applied. (True/False)

2. (a) Find a root of the equation 7

$x^3 - x - 11 = 0$

Using Bisection method correct to 3 decimal places.

(b) Using Regular-Falsi method, compute the real root of $xe^x = 2$. Correct to 4 decimal places. 7

3. (a) Find a root of the equation $x - e^{-x} = 0$, correct to 3 decimal places by Secant method. 7

(b) Find a root of the equation $3x^3 - 9x^2 + 8 = 0$ correct to 3 decimal places using Newton-Roaphson method. 7

4. (a) Solve by Gauss elimination method of the following equations : 7

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

(b) Solve by Gauss-Siedel method, the equations are : 7

$$10x + y + z = 12$$
$$2x + 10y + z = 13$$
$$2x + 2y + 10z = 14$$

5. (a) Derive Newton's forward interpolation formula. 7

(b) From the following table, estimate the number of students who obtained marks between 40 and 45 : 7

| Marks : | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 |
|---|---|---|---|---|---|
| No. of Students : | 31 | 42 | 51 | 35 | 31 |

6. (a) What are the merits and demerits of Lagrange's formula ? 7

(b) Apply Lagrange's method to find the value of $x$ when $f(x)=15$ from the following data : 7

| $x$ : | 5 | 6 | 9 | 11 |
|---|---|---|---|---|
| $f(x)$ : | 12 | 13 | 14 | 16 |

7. (a) Use Simpson's $3/8^{th}$ rule to find 7

$\int_0^1 \frac{dx}{1+x}$ by taking 7 ordinates. Deduce the value of $\log_e 2$.

(b) Solve $y^1 = y^2 + x$, $y(0)=1$, using Taylor's series method and compute $y(0.1)$ and $y(0.2)$. 7

8. Explain ***any four*** of the following : **3.5x4=14**

(a) Bisection method

(b) Triangularization method

(c) Finite difference operators

(d) Trapezoidal rule

(e) Brents method

(f) Linear Programming