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End Semester Examination of Semester–III, 2015
Subject : BCA
Paper : 2114 (Numerical Methods & Analysis)
Full Marks : 70
Time : 3 Hrs

The figures in the margin indicate the marks corresponding to the question

Candidates are requested to give their answers in their own word as far as practicable.

Illustrate the answers wherever necessary

Group A

1. Answer **any five** questions : 5X2=10

   i) Find the number of significant figures in V_A with respect to V_T where $V_A = 0{\cdot}05411$, $V_T = 0{\cdot}05418$.

   ii) If $\Delta x = 0{\cdot}005$ and $\Delta y = 0{\cdot}001$ be the absolute errors in $x = 2{\cdot}11$ and $y = 4{\cdot}15$, find the relative error in computation of $x + y$.

   iii) Prove that $\Delta . \nabla = \Delta - \nabla$, symbols have the usual meaning.

   iv) Find the functions, whose first difference is $9x^2 + 11x + 5$.

   v) Find $f(1{\cdot}1)$ from the table

x	0	1	2	3
f(x)	1	2	11	34

vi) Find the double root of the equation

$f(x) = x^3 - x^2 - x + 1 = 0$, choosing $x_0 = 0{\cdot}8$

vii) Show that $\Delta[Kf(x)] = K\Delta f(x)$, where K is a constant, Δ denote the difference operator.

viii) Find the backward difference table for

x	0	1	2	3	4
f(x)	2	3	12	35	78

Group B

Answer **any five** questions : 5X4=20

2. If N is a function of five different measurable quantities u, v, w, x, y and is given by $N = \frac{u^p v^q w^r}{x^s y^t}$, find an upper limit to the relative error, is the measure of N.

3. Find the error of Trapezoidal rule for $I_T = \frac{h}{2}\left[f(a)+f(b)\right]$.

4. State the condition that the function $f(x) = 0$ has a real root.

5. Show that Newton-Raphson method has a quadratic rate of convergence.

6. Explain the method of Bisection for computing a simple real root of an equation $f(x) = 0$.

7. Show the sum of Lagrangian functions is unity.

8. Explain the principle of propagation of errors and explain how it affects numerical computation.

Group C

Answer **any four** questions : 4X10=40

9. Establish the Newtons Forward interpolation formula.

10. Establish Gauss-Legendre quadrature formula for equidistant ordinates and hence Simpson's $\frac{1}{3}$ rule.

11. Find the Computational formula for fixed point iteration and also discuss the Convergence of method of iteration.

12. Discuss the Gauss-Elimination method for a system of 3-equation with 3-unknowns.

13. a) Describe Modified Euler's method for solving the differential equation

$$\frac{dy}{dx} = f(x, y)$$

in a finite internal [a, b] assuming that y(a) has a known value y_0.

b) Describe Euler's method to estimate the solution of

$$\frac{dy}{dx} = xy - 0{\cdot}1y^2, \quad y(0) = 0.$$

correct upto four significance figures at $x = 0{\cdot}1$ using a stepsize $h = 0{\cdot}02$. 5+5

14. a) Use Picard's method to compute y(0·1), from the differential equation

$$\frac{dy}{dx} = x + y, \quad y(0) = 1.$$

b) Find the greatest eigen value and the corresponding eigen vector for the matrix

$$A = \begin{bmatrix} 2 & 4 & 6 \\ 3 & 9 & 15 \\ 4 & 16 & 36 \end{bmatrix}$$

5+5