CS/BCA(H)/Even/4th Sem/BM-401/2014

2014

Statistics, Numerical Methods & Algorithms

Time Alloted : 3 Hours   **Full Marks : 70**

The figure in the margin indicate full marks.
Candidates are required to give their answers in their
own words as far as practicable

GROUP - A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following:

                                                            10x1=10

   i)   The relative percentage error in approximate representation
        of 4/3 as 1.33 is

        a) 25%

        b) 2.5%

        c) .25%

        d) 0.025%

   ii) First order forward difference of a constant function is

        a) 0

        b) 4

        c) 3

        d) 1

2064   1   [Turn over]

iii) When the no 1.004355 is rounded to 5 decimal places then it becomes

   a) 1.00436

   b) 1.00435

   c) 1.00434

   d) None of these

iv) For Trapezoidal rule of numerical integration, the number of sub-intervals should be

   a) Even

   b) Odd

   c) Even or odd

   d) Multiple of three

v) When the Guass elimination method is used to solve BX= A, B is transformed into

   a) A lower triangular matrix

   b) Zero matrix

   c) An upper triangular matrix

   d) None of these

vi) The order of convergence of Regula-falsi method is

   a) 1

   b) 1.52

   c) 1.62

   d) 2

vii) Which of the following methods give faster convergence?

   a) Gauss-Jacobi Method

   b) Gauss- Seidel Method

   c) Gauss-Elimination Method

   d) Gauss-Jordan Elimination Method

2064   2

viii) The condition of convergence for the method of fixed point iteration is

    a) $|\varphi'(x)| < 1$

    b) $|\varphi'(x)| > 1$

    c) $|\varphi'(x)| \le 1$

    d) $|\varphi'(x)| \ge 1$

ix) The truncation error in 4th order Runge-Kutta Method is of the

    a) $O(h^2)$

    b) $O(h^3)$

    c) $O(h^4)$

    d) $O(h^5)$

x) A system of linear equations is said to be diagonally dominant if its coefficient matrix satisfy

    a) $|a_{ii}| \le \sum |a_{ij}|$

    b) $|a_{ii}| \ge \sum |a_{ij}|$

    c) $|a_{ii}| > \sum |a_{ij}|$

    d) $|a_{ii}| < \sum |a_{ij}|$

xi) If a number be rounded off to m decimal places, then the absolute error

    a) $E_a \le \frac{1}{2}10^{-m}$

    b) $E_a \le \frac{1}{2}10^{m}$

    c) $E_a \ge \frac{1}{2}10^{-m}$

    d) $E_a \ge \frac{1}{2}10^{m}$

xii) **Weddle's rule gives exact result for a polynomial of degree**

      a) ≤ 5

      b) $=6$

      c) ≤ 7

      d) $=8$

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GROUP - B
(Short Answer Type Questions)
Answer any *three* of the following.   3x5=15

2. When h=1, prove that

$$\Delta\left\{\frac{1}{f(x)}\right\} = -\frac{\Delta f(x)}{f(x).f(x+1)}$$

and hence or otherwise find the value of $\Delta^n\left(\frac{1}{x}\right)$.

3. Find the value of f(12) from the following table correct up to 4 decimal places:

x:	10	15	20	25	30	35
f(x):	35.3	32.4	29.2	26.1	23.2	20.5

4. Using regular falsi method find a real root of $x^3 + 2x - 2 = 0$, correct upto four significant figures.

5. Evaluate

$$\int_{1}^{5} log_{10} x\, dx$$

taking 8 sub-intervals, correct upto four decimal places by simpson's 1/3rd rule.

6 Compute y(0,2), from the equation

$$\frac{dy}{dx} = x - y, y(0) = 1$$

taking h=0.1, by Runge-kutta method of fourth order, correct to five decimal places.

2064   5   [Turn over]

GROUP - C
(Long Answer Type Questions)
Answer any *three* of the following.   3x15=45

7. (a) Derive Newton's Forward Interpolation Formula.

    (b) The following table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface:

Height (x):	100	150	200	250	300	350	400
Distance (d):	10.66	13.06	15.07	16.84	18.45	19.93	21.30

    Find the value of d when x=390 feet.

8. (a) Show that Newton- Raphson method has second order convergence.

    (b) Solve the following system of equations by Gauss-Jacobi iteration method.

    $8x-y+z=18$

    $2x+5y-2z=3$

    $x+y-3z=-6$

    [7+8]

9. (a) Evaluate $\int_{0}^{1} \dfrac{dx}{1+x^2}$, by using simpson's 1/3 rule taking n=4

    and hence find the value of π.

    (b) Solve by Gauss-seidel iteration method, the system

    $x+y+4z=9$

    $8x-3y+2z=20$

    $4x+11y-z=33$

    [8+7]

10. (a) Apply Euler's method to find the value of y at x=0.02 for the initial value problem

$$dy/dx = y + e^x$$ with y(0)=0, taking h=0.01.

(b) Find the real root of the equation cos x=3x-1 correct to 4 decimal places using successive approximation method.

[8+7]

11. (a) Evaluate

$$\int_0^{\pi/2} \sqrt{1 - 0.162 \, Sin^2 \theta} \, d\theta$$

correct upto 4 decimal places by Trapezoidal rule, taking n=10.

(b) Compute the value of y at x=0.01 using Runge-kutta method of order 4 from the differential equation dy/dx=x²+y with y(0)=1 and hence compare your result with the exact solution.

[7+8]

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