Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/BCA/SEM-4/BM-401/2013

2013
STATISTICS, NUMERICAL METHODS & ALGORITHMS

Time Allotted : 3 Hours   *Full Marks :* 70

The figures 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 :   10 × 1 = 10

    i)   Newton-Raphson method is also known as method of

         a)   straight line   b)   tangent

         c)   normal   d)   none of these.
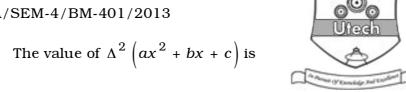
    ii) Order of the term *h* in the error term of trapezoidal rule
         is of order

         a)   1   b)   2

         c)   3   d)   4.

iii) The value of $\Delta^2 \left(ax^2 + bx + c \right)$ is

    a) $2\,an + b$ b) $2\,an$

    c) $2\,an^2$ d)   none of these.

iv) The number of significant digits in 1·00234 is

    a)   3   b)   4

    c)   5   d)   6.

v) If $y_0 = 2$, $y_1 = 4$, $y_2 = 8$, $y_4 = 32$, then y_3 is equal to

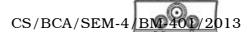   a)   5   b)   6

    c)   15   d)   none of these.

vi) Which of the following methods is an iterative method ?

    a)   Gauss Elimination method

    b)   Gauss-Jordan method

    c)   Gauss-Jacobi method

    d)   Crout's method.

vii) The order of convergence of Newton-Raphson methods is

    a)   1   b)   2

    c)   2   d)   4.

viii) The relation between shift operator E and forward difference operator Δ is given by

a) $\Delta = 1 + E$ b) $E = 1 + \Delta$

c) $E = \Delta$ d) $E = \Delta + 2$.

ix) The first order of forward difference of a constant function is

a) 0 b) 1

c) 4 d) 3.

x) Lagrange's interpolation formula is used for

a) Equally space point b) Unequally space point

c) Both (a) & (b) d) None of these.

xi) The equation $x^x + x - 1 = 0$ is a

a) algebraic equation

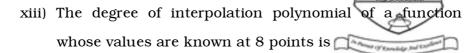b) transcendental equation

c) both (a) & (b)

d) none of these.

xii) Order of h in the error expression of Simpson's 1/3rd rule is

a) 2 b) 4

c) 3 d) 5

xiii) The degree of interpolation polynomial of a function whose values are known at 8 points is

    a)   5   b)   6

    c)   7   d)   8.

xiv) The number of significant digits in 0·00303 is

    a)   6   b)   5

    c)   3   d)   2.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

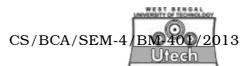2.   Find the missing terms of the following table :

X :	45	50	55	60	65
$f(X)$:	3	?	2	?	4

3.   Solve the system of equation by LU method :

$3x + 4y + 7z = 8$

$x + 2y + 3z = 6$

$x + 5y + 9z = 9$

4. Find the real root of equation $x^3 - x - 1 = 0$ by the method of bisection.

5. Compute by Newton-Raphson method the positive root of equation $3x^2 + 2x = 9$ correct to four significant figures.

6. Compute the value of y at $x = 1·3$ using Runge-Kutta method of fourth order by solving the differential equation.

$\dfrac{dy}{dx} = x^2 + y^2$, with $x_0 = 1$, $y_0 = 0$ and step size $h = 0·3$.

GROUP – C
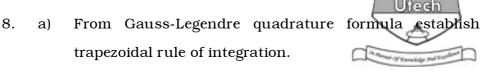
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Use Newton's divided difference formula to find $f (8)$ and $f (15)$ from the following table :

x :	4	5	7	10	11	13
$f (x)$:	48	100	294	900	1210	2028

   b) Find the value of fifth root of 255.   7 + 8

8. a) From Gauss-Legendre quadrature formula establish trapezoidal rule of integration.

   b) By using Simpson's one third rule calculate

   $$\int_0^1 \left(x^3 - x \right) \, \mathrm{d}x.$$ Compute relative error. 7 + 8

9. a) Solve the system of equation by Inverse Matrix method :

   $x + y + z = 3$

   $2x - y + 3z = 16$

   $3x + y - z = -3.$

   b) Find by Taylor's series method the value of y at $x = 0 \cdot 1$ and $x = 0 \cdot 2$ to 5 places of decimal from $\dfrac{\mathrm{d}y}{\mathrm{d}x} = x^2 y - 1, \ y(0) = 1.$ 7 + 8

10. a) Compute $y(0 \cdot 2)$ from the equation $\dfrac{\mathrm{d}y}{\mathrm{d}x} = x - y, \ y(0) = 1$ taking $h = 0 \cdot 1$ by Rune-Kutta method correct to four decimal places.

    b) Solve by Gauss elimination method.

    $x - y - z = 1$

    $2x - 3y + z = 1$

    $3x + y - z = 2.$ 7 + 8

11. a) Find a real root of the equation $f(x) = \log x - \cos x$ using bisection method up to 3 decimal places.

   b) Solve the system of equation by Gauss elimination method :

   $x + 3y + 2z = 5$

   $2x - y + z = -1$

   $x + 2y + 3z = 2$ 　　　　　　　　　　　 7 + 8

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