

Name :
Roll No. :
Invigilator's Signature :

CS/BCA/SEM-4/BM-401/2011
2011
STATISTICS, NUMERICAL METHODS
AND 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 : $10 \times 1 = 10$
- i) The number of significant digit in 0.00303 is
 - a) 6 b) 5
 - c) 3 d) none of these.

 - ii) When rounded off after 4 decimal places 0.003256 becomes
 - a) 0.0032 b) 0.0033
 - c) 0.0326 d) none of these.



- iii) Divided difference formula is used for
- a) equispaced point
 - b) unequally spaced points
 - c) both (a) & (b)
 - d) none of these.
- iv) Newton's forward formula is used for interpolating the value of y near the
- a) beginning of a set
 - b) end of a set
 - c) central of the set
 - d) none of these.
- v) In backward difference $\nabla^2 f(x)$ is
- a) $\nabla f(x) - \nabla f(x + h)$
 - b) $\nabla^2 f(x) - \nabla^2 f(x - h)$
 - c) $\Delta f(x) - \Delta f(x + h)$
 - d) none of these.
- vi) The iterative method to solve a system of equation is
- a) Gauss-elimination
 - b) Gauss-Jordan
 - c) Gauss-Seidel
 - d) None of these.
- vii) The error in the Simpson's $\frac{1}{3}$ rd method is of order
- a) h
 - b) h^2
 - c) h^3
 - d) h^4 .



- viii) Newton-Raphson method fails when
- a) $f'(x) = 0$ b) $f'(x) > 0$
c) $f'(x) < 0$ d) none of these.
- ix) Diagonal dominance is must for
- a) Gauss-Seidel method
b) Gauss-Jordan's matrix inversion method
c) Gauss elimination method
d) none of these.
- x) The second order Runge-Kutta formula has a truncation error which is of order of
- a) h^2 b) h^3
c) h^4 d) none of these.
- xi) The order of h in the error expression of trapezoidal rule is
- a) 1 b) 2
c) 3 d) 4.
- xii) Relative error in numerical method where x_Γ = true value of solution $\neq 0$, x_A = Approximate value of solution is
- a) $|x_\Gamma - x_A|$ b) $\frac{|x_\Gamma - x_A|}{x_\Gamma}$
c) $\frac{|x_\Gamma - x_A|}{x_\Gamma} \times 100$ d) none of these.



xiii) Which is the direct method ?

- a) Gauss-elimination method
- b) Gauss-Jacobi method
- c) Gauss-Seidel method
- d) none of these.

xiv) Newton-Raphson method is also known as

- a) chord method
- b) tangent method
- c) secant method
- d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. By means of Newton's divided differential interpolation formula find the value of $f(8)$ from the following table :

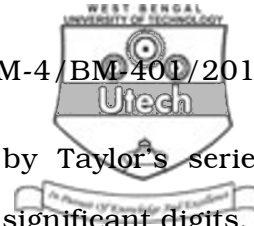
$x =$	4	5	7	10	11	13
$f(x) =$	48	100	294	900	1210	2028

3. Prove that for small values of 'h' $\Delta^{n+1} f(x_0) \approx h^{n+1} f^{n+1}(x_0)$.

4. Evaluate $\int_0^1 \cos x \, dx$ taking five equal intervals. Explain the reason behind your choice of integration formula used.

5. Compute $f(1.42)$ from the following data :

x	1.1	1.2	1.3	1.4
$f(x)$	7.831	8.728	9.697	10.744



6. Solve $\frac{dy}{dx} = x^2y - 1$, where $y(0) = 1$ by Taylor's series method. Also find $y(0.1)$ correct to seven significant digits.
7. How many digits are to be taken in computing $\sqrt{13}$ so that error does not exceed 0.1% ?

GROUP - C

(Long Answer Type Questions)

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

8. a) Compute $f(1.16)$ from the following table :

x	1.11	1.12	1.13	1.14	1.15	1.16
$f(x)$	6.2321	6.2544	6.2769	6.2996	6.3225	6.3456

- b) Find the positive root of the equation $x^2 + 2x - 2 = 0$, correct up to 2 significant figures by Newton-Raphson method.

- c) Estimate the missing term from the table :

x	2	4	6	8	10
y	5	13	*	53	85

9. a) Solve the following system of linear equations by Gauss-Seidel method :

$$6x + 15y + 2z = 72$$

$$27x + 6y - z = 85$$

$$x + y + 54z = 110.$$



- b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's one-third rule taking $h = \frac{1}{6}$ correct up to 3 decimal places.

- c) Find the root of the equation $x \log_{10} x = 1 \cdot 2$, correct to 2 decimal places by Bisection method. 6 + 4 + 5

10. a) Solve by Gauss elimination method :

$$x + 2y + 3z = 10$$

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

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

- b) Evaluate $\int_0^1 (4x - 3x^2) dx$ taking 10 intervals by

Trapezoidal rule and then find the absolute error.

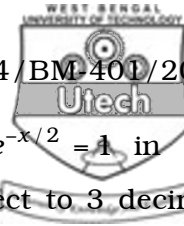
- c) Prove that $E = e^{hD}$, $D = \frac{d}{dx}$ and E is the shift operator.

7 + 5 + 3

11. a) Use Euler's method to find the solution of $\frac{dy}{dx} = x - y$

with $y(0) = 1$, $h = 0.2$ at $x = 0.4$.

- b) Find the value of $y(0.2)$ by 4th order Runge-Kutta method which is correct to *four* decimal places, where $\frac{dy}{dx} = y^2 - x^2$, $y(0) = 1$ taking $h = 0.1$. 7 + 8



12. a) Compute a root of the equation $x^2 e^{-x/2} = 1$ in the interval $[0, 2]$ by secant method correct to 3 decimal places.

b) Find the inverse of the matrix $\begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ by Gauss' method. 7 + 8

13. a) Solve the following equation by Jacobi's iteration method :

$$10x - 2y - z - w = 3$$

$$-2x + 10y - z - w = 15$$

$$-x - y + 10z - 2w = 27$$

$$-x - y - 2z + 10w = -9$$

b) Solve by LV factorization method :

$$2x - 3y + z = -1$$

$$x + 2y - 3z = -4$$

$$x - 4y + z = -6$$

7 + 8