

Name :
Roll No. :
Invigilator's Signature :

**CS/B.Tech (EIE)/SEM-3/CS-302/2010-11
2010-11**

NUMERICAL METHODS AND PROGRAMMING

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 :

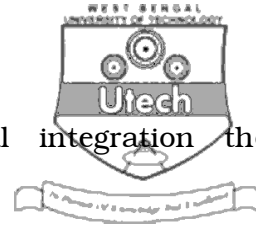
10 × 1 = 10

i) In bisection method, if $[a_0, b_0]$ be the initial interval then condition satisfied by a_0 and b_0 for the existence of a root, for the equation $f(x) = 0$, is

- a) $f(a_0)f(b_0) < 1$
- b) $f(a_0)f(b_0) > 0$
- c) $f(a_0)f(b_0) < 0$
- d) $f(a_0)f(b_0) > 1$.

ii) $\frac{1}{\delta E^2}$ is equal to

- a) Δ
- b) ∇
- c) E
- d) none of these.



iii) For trapezoidal rule of numerical integration the number of sub-intervals should be

- a) Even
- b) Even or Odd
- c) Odd
- d) Multiple of three.

iv) In solving simultaneous equations by Gauss-Jordan method, the coefficient matrix is reduced to

- a) Upper triangular matrix
- b) Lower triangular matrix
- c) Diagonal matrix
- d) Tri-diagonal matrix.

v) Runge-Kutta formula has a truncation error which is of the order of

- a) h^2
- b) h^3
- c) h^4
- d) h^5 .

vi) If $f(x) = \frac{1}{x}$, the divided difference $[a, b, c]$ is

- a) $\frac{1}{a+b+c}$
- b) $\frac{1}{abc}$
- c) $\frac{1}{a^2+b^2}$
- d) $\frac{1}{a+b-c}$.



- xi) The operator ++ is a
- a) Unary operator b) Binary operator
- c) Ternary operator d) Null operator.
- xii) If $i = 6$ and $t = ++i$, then the value of t is
- a) 7 b) 6
- c) 5 d) 8.

GROUP – B

(Short Answer Type Questions)

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

2. Find the unknowns p and q from the following table :
- | | | | | | |
|-------|-----|-----|-----|-----|------|
| $X :$ | 45 | 50 | 55 | 60 | 65 |
| $Y :$ | 3.0 | p | 2.0 | q | -2.4 |
3. Prove that $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$.
4. If $\frac{5}{3}$ is represented by the approximate number 0.8333, compute absolute, relative and the percentage errors.
5. Compute Romberg estimate R_{22} for $\int_1^2 \frac{1}{x} dx$.
6. Find the inverse of the matrix by Gauss elimination method :
- $$\begin{bmatrix} 2 & -2 & 4 \\ 2 & 3 & 2 \\ -1 & 4 & -1 \end{bmatrix}$$



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following.

3 × 15 = 45

7. a) Find a root of the equation $x^3 - 3x - 5 = 0$ by the method of false position correct to three decimal points.

b) Solve the given system of equation :

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

$$2x + 20y - 2z = -44$$

$$-2x + 3y + 10z = 22$$

by Gauss-Seidel method.

c) Explain the geometric significance of Newton-Raphson method for computing the real root of an equation $f(x) = 0$. 5 + 5 + 5

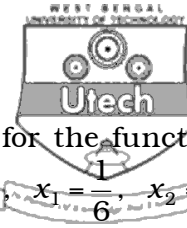
8. a) Solve the following system of equations by LU-factorization method :

$$x + y + z = 9$$

$$2x - 3y + 4z = 13$$

$$3x + 4y + 5z = 40.$$

b) Using Runge-Kutta method of order 4, find $y(0.2)$ given that $\frac{dy}{dx} = 3e^x + 2y$, $y(0) = 0$, $y(0) = 1$ taking $h = 0.1$. 7 + 8



9. a) Construct the interpolation polynomial for the function $y = \sin \pi x$, choosing the points $x_0 = 0$, $x_1 = \frac{1}{6}$, $x_2 = \frac{1}{2}$ and find $f\left(\frac{1}{3}\right)$.

b) Write a C-program which evaluates $\sqrt{27}$ correct to seven places of decimals by Newton-Raphson method.

c) Find $y'(x)$ given :

$x = 0$	1	2	3	4
$y(x) = 1$	1	15	40	85

Hence, find $y'(x)$ at $x = 0.5$, where $y'(x)$ is $\frac{dy}{dx}$. 5 + 5 + 5

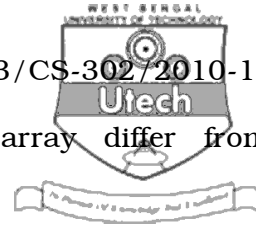
10. a) The following table gives the viscosity of oil as function of temperature. Use Lagrange's formula to find viscosity of oil at a temperature of 140° .

Temperature :	110	130	160	190
Viscosity :	10.8	8.1	5.5	4.8

b) The values of $\sin x$ are given below, for different values of x . Form a difference table and from this table find $\sin 52^\circ$.

x	30°	35°	40°	45°	50°	55°
$y = \sin x$	0.5000	0.5736	0.6428	0.7071	0.7660	0.8192

c) Derive Simpson's one third rule from Newton-Cote's quadrature formula. 5 + 5 + 5



11. a) What is an array ? How does array differ from structure ? Explain with example.
- b) How does an ordinary function differ from a recursive function ? How is a recursive function converted to a non-recursive one ? Discuss.
- c) Write a C-program to multiply two given matrices of given order. 5 + 5 + 5

=====