	Utech
Name:	
Roll No.:	To the same of the state of the
Invigilator's Signature :	

CS/B.TECH(NEW)BME/ECE/EE/EIE/PWE/ICE/EEE/ SEM-3/M(CS)-301/2012-13

2012 NUMERICAL METHODS

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)

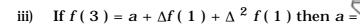
1. Choose the correct alternatives for any *ten* of the following :

 $10 \times 1 = 10$

- i) In the problem "Find the area of a circle having radius 2; given π = 3.14", the kind of error of the approximation 3.14 for π is
 - a) Truncation error
- b) Round-off error
- c) Inherent error
- d) Relative error.
- ii) The number 9.6506531 when round-off to 4 places of decimal will give
 - a) 9.6506
- b) 9.6507
- c) 9.6505
- d) none of these.

3003(N) [Turn over

CS/B.TECH(NEW)BME/ECE/EE/EIE/PWE/ICE/EEE/SEM-3/M(CSF301/2012-13



a) f(0)

b) f(1

c) f(2)

d) f(3).

iv) Which of the following is ture?

- a) $E = 1 \Delta$
- b) $E = 1 + \Delta$
- c) $\Delta = E + 1$
- d) $E = \Delta^{-1}$.

v) It cannot be recommended to construct an interpolation polynomial for a function f(x) if

- a) f(x) is not a polynomial
- b) f(x) is not derivable somewhere
- c) f(x) has abrupt changes
- d) graph of f(x) is unknown.

vi) The degree of precision of Simpson's $\frac{1}{3}$ rd rule is

a) 1

b) 2

c) 3

d) 4

vii) In evaluating $\int_{a}^{b} f(x) dx$, the error in Trapezoidal rule

is of order

a) h^3

b) h⁴

c) h^2

d) h.

3003(N)



- viii) When Gauss-Elimination method is used to solve AX = B, A is transformed to a
 - a) null matrix
 - b) upper-triangular matrix
 - c) identity matrix
 - d) diagonally-dominant matrix.
- ix) If $\frac{dy}{dx} = x^2 + y$ and y(0) = 1, then y(0.02) according to Euler's method is [h = 0.01]
 - a) 1.02

b) 1.04

c) 1.00

- d) 0.99.
- x) The finite difference method is used to solve
 - a) a system of ordinary differential equation
 - b) a Boundary Value Problem
 - c) a partial differential equation
 - d) a system of transcendental equation.
- xi) The local truncation error in Euler's method for the solution of ODE of first order is
 - a) O(h²)
- b) $\frac{h^2}{2} y'' (x_m + \theta h)$
- c) $h^2 y'' (x_m + \theta h)$
- d) none of these.
- xii) One root of the equation $x^2 + 2x 2 = 0$ lies between
 - a) 1 and 2
- b) 0 and 0.5
- c) 0.5 and 1
- d) none of these.

CS/B.TECH(NEW)BME/ECE/EE/EIE/PWE/ICE/EEE/SEM-3/M(CS) 301/2012-13



(Short Answer Type Questions)

Answer any three of the following.

$$3 \times 5 = 15$$

2. Find f(5) from the following data:

X	0	2	3	4	7	8
f(x)	4	26	58	112	466	668

- 3. Find the value of $\int_{0}^{\pi/2} \sqrt{1 0.162 \sin^2 x} \ dx \text{ using}$ Simpson's $\frac{1}{3}$ rd rule taking six equal subintervals.
- 4. Using Newton-Raphson method find $\sqrt[4]{32}$ correct upto 4 places of decimal.
- 5. Find the inverse of the following matrix using Gauss Elimination method.

$$\left(\begin{array}{cccc} 1 & 2 & 6 \\ 2 & 5 & 15 \\ 6 & 15 & 46 \end{array}\right)$$

6. Use Fourth order Runge-Kutta method to find an approximate value of y (0.2) given that y (0) = 0 and $\frac{\mathrm{d}y}{\mathrm{d}x} = 1 + y^2.$

3003(N)

CS/B.TECH(NEW)BME/ECE/EE/EIE/PWE/ICE/EEE/SEM-3/M(CS) 301/2012-13

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following.

 $3 \times 15 = 45$

1

- 7. a) Round off 31. 5218 to one significant figure.
 - b) What is the percentage error in approximating $\frac{4}{3}$ to 1.3333?
 - c) Prove that $E \equiv e^{hD}$, where E, h and D are the shift operator, the step length and the differential operator respectively. Hence, show that $hD \equiv \sin h^{-1}$ ($\mu\delta$), where, μ and δ have their usual meanings. 3+2
 - d) Define interpolation and extrapolation. Deduce the Newton's forward interpolation formula. 2 + 5
- 8. a) Find by Lagrange's formula, the interpolation polynomial which corresponds to the following data: 5

x: 0 1 2 3 4

f(x): 3 6 11 18 27

- b) Find a real root of the equation $x^3 2x 5 = 0$ by using Regula-Falsi method.
- c) Derive Simpson's one-third rule from Newton-Cote's quadrature formula.

CS/B.TECH(NEW)BME/ECE/EE/EIE/PWE/ICE/EEE/SEM-3/M(CS)-301/2012-13

9. a) Solve the system of linear equation by LU Factorization

Method:

$$2x - 6y + 8z = 24$$

$$5x + 4y - 3z = 2$$

$$3x + y + 2z = 16$$

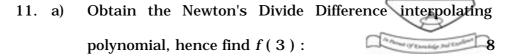
b) Compute y (0.5), by Milne's predictor-corrector method from $\frac{\mathrm{d}y}{\mathrm{d}x} = 2e^{-x} - y$,

given that
$$y$$
 (0.1) = 2.0100, y (0.2) = 2.0401, y (0.3) = 2.0907, y (0.4) = 2.1621.

- 10. a) Find the root of the equation $x \tan x = 1.28$, that lies in the interval (0, 1), correct to 4 decimal places, using Bisection method.
 - b) Find the solution of the following differential equation by Euler's method for x = 1 by taking h = 0.2, dy/dx = x + y with y = 1 when x = 0.
 - c) Show that $(1 + \Delta) (1 \nabla) = 1$.

3003(N)

CS/B.TECH(NEW)BME/ECE/EE/EIE/PWE/ICE/EEE/SEM-3/M(CS)-301/2012-13



<i>x</i> :	0	1	2	4	5	6
f (x):	1	14	15	5	6	19

b) Solve the following system of equations using Gauss elemination method:

$$-x + y + 10z = 35.61$$

$$x + 10 y + z = 20.08$$

$$10 + y - x = 11.19$$