



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH (CE/OLD)/SEM-4/CE-401/2013

2013

MATHEMATICS – II

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 Simpson's one-third formula for the integration

$$\int_a^b f(x) dx, \text{ the degree of precision is}$$

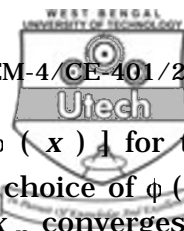
a) 0

b) 1

c) 2

d) 3.

- 4008 (O)



vi) In fixed point iteration method $[x = \phi(x)]$ for the equation $\pi x = \sin(x)$, the appropriate choice of $\phi(x)$ such that sequence $x_0, x_1, x_2, \dots, x_n$ converges to the root is

- a) $\frac{\sin(x)}{\pi}$ b) $\frac{\cos(x)}{\pi}$
 c) $\cos(x)$ d) none of these.

vii) The condition of convergence of approximations for a real foot $\phi(x) = x$ by method of iteration is

- a) $\max [|\phi'(a)|, |\phi'(b)|] = 0$ in (a, b)
 b) $\max [|\phi'(a)|, |\phi'(b)|] < 1$ in (a, b)
 c) $\min [|\phi'(a)|, |\phi'(b)|] = 0$ in (a, b)
 d) $\min [|\phi'(a)|, |\phi'(b)|] < 1$ in (a, b) .

viii) Runge-Kutta method is used to

- a) interpolate
 b) solve a transcendental equation numerically
 c) integrate a definite integral numerically
 d) solve a first order ordinary differential equation numerically.

ix) Which of the following numbers has greatest precision ?

4.3201, 4.32, 4.320106, 4.3.

- a) 4.3201 b) 4.32
 c) 4.320106 d) 4.3.

- 4008 (O)

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

$3 \times 5 = 15$

2. Assuming that the following values of y belong to a polynomial of degree 4, compute the next three values :

x	0	1	2	3	4	5	6	7
y	1	-1	1	-1	1	—	—	—

3. If $\Delta x = 0.005$ and $\Delta y = 0.001$ be the absolute errors in $x = 2.11$ and $y = 4.15$, find the relative error in computation of $x + y$.

4. Find out the integration value, correct up to 5 decimal places of the integration $\int_0^1 \frac{1}{1+x^2} dx$, taking number of sub-intervals $n = 10$ by Simpson's $\frac{1}{3}$ rule.

5. Use inverse interpolation formula to find out x when $f(x) = 0.645$ correct up to one decimal place from the following table :

$x :$	0.3	0.5	0.6
$f(x) :$	0.6179	0.6915	0.7257



6. Solve the following equation by Gauss elimination method:

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

$$-x + 2y = -2$$

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

$$x + 2t = 0.$$

7. Find the moment generating function of the Binomial distribution and from it determine its mean and variance.

GROUP - C

(Long Answer Type Questions)

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

8. a) Derive Trapezoidal integration formula from Newton-Cotes formula.

b) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$, by Trapezoidal rule taking

number of sub-intervals $n = 10$, correct to 4 decimal places.

c) Write down the inherent error formula for trapezoidal rule for numerical integration. $7 + 7 + 1$

9. a) Derive Newton's Backward difference interpolation formula.

b) Find a real root of the equation $x^3 - x - 11 = 0$ correct up to 4 decimal places using Newton-Raphson in the interval $(2, 4)$ and estimate the error in this method.

$5 + (7 + 3)$



10. a) Derive the Newton-Raphson formula for computing the real root of an equation $f(x) = 0$.

b) Explain the geometrical significance of Newton-Raphson method.

c) Show that Newton-Raphson method has a quadratic convergence.

5 + 5 + 5

11. a) Use Euler's method to find an approximate value of y corresponding to $x = 1$, given that, $\frac{dy}{dx} = x + y$ and

$y = 1$, when $x = 0$.

b) With usual notations, prove that,

$$\Delta^n \left(\frac{1}{x} \right) = (-1)^n, \frac{n! h^n}{x(x+h) \dots (x+nh)} \quad 5 + 10$$

12. a) Given that the mode of the following frequency distribution of 70 observations is 58.75. Find the missing frequencies f_1 and f_2 .

Class	Frequency
52 — 55	15
55 — 58	f_1
58 — 61	25
61 — 64	f_2

b) Find one real root of $10^x + \sin(x) + 2x = 0$, by the bisection method in the interval $(-1, 0)$, correct up to 3 significant figures.

5 + 10



13. Use the method of least squares to fit the curve

$$f(x) = c_0 x + \left(\frac{c_1}{\sqrt{x}} \right) \text{ for the following data :}$$

$x :$	0.2	0.3	0.5	1	2
$f(x) :$	16	14	11	6	3

Find also the least square errors (correct up to 3 decimal places).

=====