Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(CE-OLD)/SEM-4/CE-401/2012

2012

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) Class boundaries of 126 - 130 and 131 - 135 are

a) 125·5 - 130·5 & 130·5 - 135·5

b) 126·5 - 130·5 & 131·5 - 135·5

c) 127 - 131 & 132 - 136

d) 125 - 129 & 130 - 134.

ii) The relation between A.M., G.M. and H.M. be

A.M. ≥ G.M.≥ H.M.

a) true b) false.

iii) For asymmetrical distribution, the relation between Mean, Median and Mode be

a) Mean – Mode = 3 (Mean – Median)

b) Mean – Median = 3 (Mean – Mode)

c) Mean – Mode = 2 (Mean – Median)

d) none of these.

iv) Round-off the number 3·265, correct up to 2 decimal places, is

a) 3·26 b) 3·27

c) 3·20 d) none of these.

v) Mode can be calculated from

a) Frequency Polygon b) Ogives

c) Histogram d) None of these.

vi) Relation between E and Δ is

a) $E \equiv 1 + \Delta$ b) $E \equiv 1 - \Delta$

c) $E \equiv \Delta - 1$ d) none of these.

vii) In Simpson's $\frac{1}{3}$ rd rule for finding $\int_a^b f(x)\,dx$, $f(x)$ is approximated by some

a) line segments b) parabolas

c) circular section d) parts of ellipse.

viii) The Rate of Convergence of Newton-Raphson method is

a) 2 b) 3

c) 1 d) None of these.

ix) E means

a) Shift Operator b) Difference Operator.

x) $\Delta\nabla \equiv \nabla - \Delta$

a) true b) false.

xi) Trapezoidal Rule can be applied for

a) even no. of sub-intervals

b) odd no. of sub-intervals

c) both odd and even no. of sub-intervals

d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. Find the missing terms in the following table :

x	0	5	10	15	20	25
$f(x)$	7	11	—	18	—	32

3. Prove that $\Delta\nabla \equiv \Delta - \nabla$ and $E\Delta \equiv \Delta E$.

4. Given $\frac{dy}{dx} = x^3 + y$, $y(0) = 1$, compute y (0·2) by Euler's method taking h = 0·01.

5. Apply Simpson's $\frac{1}{3}$rd Rule to evaluate $\int_0^6 \frac{dx}{(1+x)^2}$, taking 6 equal intervals, correct up to 3 decimal places.

6. Using Newton-Raphson method, find the root between 0 and 1, correct up to four decimal places, of the equation $x^3 - 6x + 4 = 0$.

7. If x_1 and x_2 are two positive values of a variate, prove that their geometric mean is equal to the geometric mean of their arithmetic and harmonic means.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. a) Calculate the Mean, Median and Mode for the following frequency distribution :

Height in inches	56-60	61-65	66-70	71-75	76-80
No. of persons	7	25	43	28	7

b) Prove that $f(4) = f(3) + \Delta f(2) + \Delta^2 f(1) + \Delta^3 f(1)$ and $\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$. 8 + 7

9. a) Out of 400 observations, 100 observations have the value one and the rest of the observations are zero. Find the Mean and S.D. of 400 observations taken together.

b) Using Lagrange's Interpolation Formula, find a polynomial which passes through the points (0, –12), (1, 0), (3 , 6) and (4, 12). 8 + 7

10. a) Using Newton's Divided Difference formula, find $f(6)$ from the following table :

x	5	7	11	13	21
$f(x)$	150	392	1452	2366	9702

b) Given

x	0	1	2	3	4
y	1	1	7	19	33

Find $y'(x)$ at $x = 0{\cdot}3$ by a suitable numerical method.

c) Find the Eigenvalues for the following matrix :

$$\begin{pmatrix} 10 & 2 & 1 \\ 2 & 10 & 1 \\ 1 & 1 & 10 \end{pmatrix}$$ 5 + 5 + 5

11. a) Using Netwon-Raphson Method, establish the interative formula to calculate square root of N and hence find $\sqrt{8}$.

b) From the following table compute $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1$:

x	1	2	3	4	5	6
y	1	8	27	64	125	216

8 + 7

12. a) Find the value of sin 32° from the following table :

x	30°	35°	40°	45°	50°
$y = \sin x$	0·5000	0·5736	0·6428	0·7071	0·7660

b) Describe the Geometrical Interpretation of Trapezoidal Rule and Condition of Convergence of Newton-Raphson Method. 7 + 8

13. a) Calculate the Arithmetic Mean and Standard Deviation of the following values of World's Gold output (in millions of lbs) for 20 different years :

94, 95, 96, 93, 87, 79, 73, 69, 68, 67

78, 82, 83, 89, 95, 103, 108, 117, 130, 97.

b) Solve by Gauss-Jacobi method of iteration :

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

$$6x + 5y + 2z = 72$$

$$x + y + 54z = 110$$ 8 + 7

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