

2013

J.M.S

Time : 3 hours

Full Marks : 80

Candidates are required to give their answers in their own words as far as practicable.

The questions are of equal value.

*Answer any **five** questions in which Q. No. 1 is compulsory.*

1. Choose the correct answer of the following :

   (a) If the first significant figure of a number is k and the number is correct to n significant figure then the relative error is less than :

   (i) $\frac{k}{10^{n-1}}$

   (ii) $\frac{1}{k \times 10^{n-1}}$

(iii) $\frac{1}{k \times 10^n}$

(iv) None of these

(b) The remainder after n terms in the expansion of e^x is less than :

(i) $\frac{x^n}{(n-1)!\,(n-x)}$

(ii) $\frac{x^{n-1}}{(n-1)!\,(n-x)}$

(iii) $\frac{x^n}{(n-1)!\,(x-n)}$

(iv) None of these

(c) An approximation formula of Newton-Raphson method is :

(i) $x_n = x_{n+1} - \frac{f(x_n)}{f'(x_n)}$

(ii) $x_n = x_{n-1} - \frac{f(x_n)}{f'(x_n)}$

(iii) $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$

(iv) None of these

(d) The process of computing the value of a function outside the range of the given interval is called :

(i) Extrapolation

(ii) Interpolation

(iii) Interpolating function

(iv) None of these

(e) The system of linear equations has at least one solution, then the equations are said to be :

(i) Consistent

(ii) Inconsistent

(iii) Simultaneous solution

(iv) None of these

(f) If A be the square matrix and the equation $|A - \lambda I| = 0$ is the characteristic equation in A and its roots are called :

(i) Eigenvalues of A

(ii) Latent roots of A

(iii) Both (i) and (ii)

(iv) None of these

(g) The system of equations AX = B is consistent iff the coefficient matrix A and the augmented matrix [AB] are of the :

(i) Same rank

(ii) Rank A > rank [AB]

(iii) Rank A < rank [AB]

(iv) None of these

(h) The relative error of the number 9.6 if both of its digits are correct will be :

(i) 0.0052

(ii) 0.0054

(iii) 0.0051

(iv) 0.0053

2. (a) Define :

(i) Inherent error

(ii) Absolute error

(iii) Forward

(iv) Backward

v

(b) If $u = 3v^7 - 6v$, find the percentage error in v at $v = 1$, if the error in v is 0.05.

3. (a) Define Algebraic and Transcendental equations with examples.

(b) Find real roots of the equation $x^3 - x - 1 = 0$ by the method of false position.

4. (a) What do you mean by intrapolation and extrapolation ? Explain with suitable examples.

(b) Estimated values of sine-ratio are given below :

x	sinx
0^o	0
30^o	0.5
60^o	0.866
90^o	1

Using Newton's backward difference interpolation formula, find sin 75^o.

5. (a) What do you mean by Numerical Differentiation ? How do you find the derivatives using Newton's forward formula ?

   (b) Calculate (upto 3 places of decimals) $\int_2^{10} \frac{dx}{1+x}$ by dividing the range into eight equal parts.

6. Explain the method of least squares for curve fitting. Certain experimental values of x and y are given below :

x	y
0	–1
2	5
5	12
7	20

If $y = a_0 + a_1 x$, find the approximate value of a_0 and a_1. $-3.473682 + 3.315789x$

7. Find the minimum value of y from the table :

x	f(x)
0	0
1	0.25

x	f(x)
2	0
3	2.25
4	16.00
5	56.25

8. Define eigenroots and eigenvectors. Find the eigenroots and eigenvectors for $\begin{bmatrix} 2 & \sqrt{2} \\ \sqrt{2} & 1 \end{bmatrix}$.

9. (a) What are the four basic properties of equations ? Explain.

(b) Solve by Gaussian elimination method :

$$2x + y + z = 0$$

$$3x + 2y + 3z = 18$$

$$x + 4y + 9z = 16$$