

**2012***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 alternatives for the following :
- (a) The ratio of absolute error to the true value is called :
- (i) ~~Relative error~~      (ii) ~~Absolute error~~  
(iii) Truncation error      (iv) None of these
- (b) The significant digit of 0.0001234 is :
- (i) ~~7~~      (ii) 4  
(iii) 8      (iv) None of these
- (c) Bisection method is \_\_\_\_\_ but \_\_\_\_\_.
- (i) Fast, fails  
(ii) Fast, sometimes fails

- (iii) Fast, never fails
- (iv) Slow, never fails
- (d) If  $f(x)$  is continuous in the interval  $(a, b)$  and if  $f(a)$  and  $f(b)$  are of opposite signs, then there is :
  - (i) At least one real root of  $f(x) = 0$  between  $a$  and  $b$
  - (ii) At most one real root of  $f(x) = 0$  between  $a$  and  $b$
  - (iii) There will be no real root of  $f(x) = 0$  between  $a$  and  $b$
  - (iv) None of these
- (e) How many initial guesses are required for Newton-Raphson method ?
  - (i) One
  - (ii) Two
  - (iii) Three
  - (iv) Any
- (f) In Simpson's  $1/3$  rule, minimum no. of points required for evaluation of integration :
  - (i) Four
  - (ii) Three
  - (iii) Two
  - (iv) One
- (g) In trapezoidal rule, no. of strips each of width 'h' is :
  - (i) Six
  - (ii) Any
  - (iii) Multiple of three
  - (iv) Even

(h) The order of h in error of 4th order Runge-Kutta method is :

(i) 4

(ii) 5

(iii) 6

(iv) None of these

2. Define forward, backward, central differences and divided differences. State and prove Newton's backward interpolating formula.

3. Find the positive roots of  $x^3 = 2x + 5$  false position method. [do only 4 iterations]

4. Solve the system of equations using Gauss-Seidel iterative methods :

$$20x - y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25$$

5. Find  $Y(12)$  using Newton's forward interpolation formula given :

X	Y
10	46
20	66
30	81
40	93
50	101

6. Find the largest eigenvalues and its

corresponding vector of the matrix  $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$

by power method.

7. Explain least square principle. Fit a least square line to the following data :

X	Y
1	2
2	5
3	3
4	8
5	7

8. (a) Discuss, with suitable example Absolute error, Relative error, Percentage error.  
(b) Explain a general formula for errors.
9. (a) Briefly describe the test for Maxima and Minima of a function at a point.  
(b) Find the maximum and minimum values of the function :

$$f(x) = x^4 - 2x^3 - 3x^2 - 4x + 4$$

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