(6 pages)

7537/SCS8A42/
SCS9A41

APRIL 2013

NUMERICAL METHODS

(For those who joined in July 2008 and after)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer :

1. Rounding off the number 32.68673 to 4 significant digits, we get a number ———————

   (a) 32.68 (b) 32.69

   (c) 32.67 (d) 32.686.

2. In bisection method if roots lies between a and b then $f(a) \times f(b)$ is ———————

   (a) <0 (b) $= 0$

   (c) > 0 (d) none of these.

3. If percentage error of a number is 3.264×10^{-4} then its relative error is _____

(a) 3.264×10^{-5} (b) 3.264×10^{-6}

(c) 3.264×10^{-7} (d) none of these.

4. The root of the equation $x^3 - 2x - 5 = 0$ lies between _____

(a) 0 and 1 (b) 1 and 2

(c) 2 and 3 (d) 3 and 4.

5. In Newton-Raphson method for finding the real root of equation $f(x) = 0$, the value of x is given by _____

(a) $x_0 - f'(x_0)/f(x_0)$ (b) x_0

(c) $f'(x_0)/f(x_0)$ (d) none of these.

6. The Lagrange's interpolation formula is used for the arguments which are _____ spaced

(a) Equally (b) Distinct

(c) Unequally (d) None of these.

7. $1 + \Delta =$ _____

(a) $E - 1$ (b) ∇

(c) E (d) δ.

8. The method of ———————— is the most systematic procedure to fit a unique curve from given data

(a) least squares (b) least cube

(c) square (d) none of these.

9. There is a class of methods as ———————— which do not require the calculations of higher order derivatives and give greater accuracy

(a) Euler's method

(b) Euler's modified method

(c) Kutta

(d) Runge-Kutta of second order.

10. Runge-Kutta method of second order is the ———————— method

(a) Euler's method (b) Taylor's method

(c) Euler's modified (d) None of these.

PART B — (5 × 7 = 35 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Using the Bisection method find the real root of the given equation $x^3 - x - 1 = 0$.

Or

(b) Explain in brief inherent error and Truncation error. What is meant by Absolute, Relative and Percentage errors? Explain.

12. (a) Solve the following system by Gauss elimination method

$$4x + y + z = 4$$
$$x + 4y - 2z = 4$$
$$3x + 2y - 4z = 6$$

Or

(b) Solvethe following system by Gauss –Jordan method :

$$5x - 2y + z = 4$$
$$7x + y - 5z = 8$$
$$3x + 7y + 4z = 10$$

13. (a) Form a difference table for the function $f(x_0) = x^3 + 5x - 7$ for $x = -1, 0, 1, 2, 3, 4, 5$ continue the table to determine $f(6)$ and $f(7)$.

Or

(b) Using Newton's Forward Interpolation formula, find the value of y when $x = 21$ from the following tabulated value :

X :	20	23	26	29
Y :	0.3420	0.3907	0.4384	0.4848

14. (a) Dividing the range into 10 equal parts, find the approximate value of $\sin x\, dx$ by Simpson's rule.

Or

(b) Apply Trapezoidal rule to evaluate $\int_0^1 \log x\, dx$ with $h = 0.2$.

15. (a) Using Euler's method, find $y(0.5)$, given that $y' = y^2 - x^2$ with $y(0) = 1$ and $h = 0.1$.

Or

(b) Obtain the Taylor's series for the differential equation $y' = y\sin x + \cos x$ with $y(0) = 0$.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Find a root of the equation $x^4 - x - 10 = 0$ which is near to 2 using Newton-Raphson method.

17. Solve, by Gauss-seidal Method

$$10x + 2y + z = 9$$
$$2x + 20y - 2z = -44$$
$$-2x + 3y + 10z = 22$$

18. Using Lagrange interpolation formula fit a polynomial to the data :

X:	0	1	3	4
Y:	−12	0	6	12

19. Determine the largest Eigen value and Eigeu vector of the given matrix :

$$A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

20. Using Runge-Kutta second order formulae compute $y(0.1)$ and $y(0.2)$ correct to four decimal places, given that $y' = y - x$ with $y(0) = 2$ and $h = 0.1$.
