

(6 pages)

MAY 2011

P/ID 40013/PPHN

Time : Three hours

Maximum : 100 marks

PART A — (10 × 2 = 20 marks)

Answer ALL the questions.

All questions carry equal marks.

1. What are transcendental equations? Give an example.
2. Find the root of the equation $x^3 - 6x + 4 = 0$ by Newton–Raphson method correct to two decimal places.
3. Explain the direct method and the iterative method of solving simultaneous equations.
4. What are the differences between Jacobi method and power method of finding Eigen values?
5. Define interpolation and extrapolation.
6. Write down the Lagrange's formula for forward interpolation.

7. What is the order of error in Trapezoidal rule and Simpson one third rule?
8. Write the n point Gauss's quadrature formula.
9. Draw the flow chart to find the sum of the series $1+2^2+3^2+4^2+\dots\dots\dots+100^2$.
10. What are executable and non executable statements? Give example.

PART B — ($5 \times 6 = 30$ marks)

Answer ALL the questions.

All questions carry equal marks.

11. (a) Derive the condition for the convergence of Newton–Raphson Method.

Or

- (b) Explain the bisection method.

12. (a) Give the theory of Gauss elimination method of solving simultaneous equations.

Or

- (b) Explain the power and Jacobi method.

13. (a) Explain least square method for fitting a straight line.

Or

- (b) Obtain the Newton's forward interpolation formula.

14. (a) Explain the Gauss Hermite method.

Or

- (b) Evaluate $\int_4^{5.2} y dx$ by Simpson's one third rule.

$x =$	4.0	4.2	4.4	4.6
$y =$	1.386294	1.435084	1.481604	1.526056

$x =$	4.8	5.0	5.2
$y =$	1.568616	1.609431	1.648658

15. (a) What are the rules to be observed while writing a FUNCTION sub program?

Or

- (b) Write a program in C to evaluate $\int_a^b x^3 dx$ by Simpson's one third rule.

PART C — (5 × 10 = 50 marks)

Answer ALL the questions.

All questions carry equal marks.

16. (a) Find the root of the equation $\log_{10} x - 1.2 = 0$ correct to three decimal places by Newton–Raphson Method.

Or

- (b) Find the root of the equation $x^3 - x - 4 = 0$ by bisection method correct to three decimal places.

17. (a) Find the inverse of the given matrix

$$A = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix} \text{ by Gauss elimination method.}$$

Or

- (b) Find the eigenvalues and eigenvectors of the given matrix by Jacobi's method

$$\begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}.$$

18. (a) Find the best fitting polynomial for the given data by cubic spline fitting.

$$x: 1 \quad 2 \quad 3 \quad 4$$

$$y: 1 \quad 2 \quad 5 \quad 11$$

Hence find $y(1.5)$.

Or

- (b) Find the best fitting straight line by least squares method for the given data and hence find the value of $f(50)$.

$$x: \quad 0 \quad 5 \quad 10 \quad 15 \quad 20 \quad 25 \quad 30$$

$$f(x): 10 \quad 14 \quad 19 \quad 25 \quad 31 \quad 36 \quad 39$$

19. (a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by

- (i) Two point Gauss–Legendre and
- (ii) Three point Gauss–Legendre quadrature formula.

Or

- (b) Evaluate $y(1.1)$ by Runge–Kutta fourth order method given that $\frac{dy}{dx} = y^2 + xy$ and $y(1) = 1$.

20. (a) Write a program in C to solve the equation $y' = 2\cos x - 3y$ with the initial condition $y(x_0) = y_0$.

Or

- (b) Write the computer oriented algorithm and program in C to interpolate y at a given point x by Lagrange's interpolation method.
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