

MAY 2012

P/ID 40013/PPHN

Time : Three hours

Maximum : 100 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What is the order of convergence in Newton-Raphson method?
2. What are transcendental equations? Give an example.
3. What are called diagonally dominant system of equations?
4. What are the requirements for a matrix to be solved by Jacobi's method?
5. Define interpolation and extrapolation.
6. Write down the normal equations for fitting a parabola by least squares method.
7. What is the order of error in (a) Trapezoidal rule and (b) Simpson's one third rule?
8. Write the Gauss-Hermite integration formula.
9. What are executable and non-executable statements? Give examples.
10. What are built-in functions? Give examples.

PART B — (5 × 6 = 30 marks)

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

11. (a) Give the theory of Newton-Raphson method of finding the root of an equation.

Or

- (b) Explain the bisection method of finding real root of an equation $f(x) = 0$.

12. (a) Explain Gauss elimination method.

Or

- (b) Describe the power and Jacobi method.

13. (a) Derive the Newton forward interpolation formula.

Or

- (b) Deduce Newton's backward interpolation formula using backward differences.

14. (a) Explain Gauss-Legendre method.

Or

- (b) Describe the Euler's method for solving first order differential equations.

15. (a) Give the rules of writing a FUNCTION sub programme in FORTRAN.

Or

- (b) Explain the executable and non-executable statements with examples.

PART C — (5 × 10 = 50 marks)

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

16. (a) Find the root of the equation $xe^x = 3$ by bisection method.

Or

- (b) Find the root of the equation $2x - \log_{10} x - 7 = 0$ by Newton-Raphson method.

17. (a) Find the eigenvalues and eigenvectors of the matrix $\begin{bmatrix} -4 & -5 \\ 1 & 2 \end{bmatrix}$ by power method.

Or

- (b) Solve the system of equations by Gauss's elimination method.

$$10x - 2y + 3z = 23$$

$$2x + 10y - 5z = -33$$

$$3x - 4y + 10z = 41.$$

18. (a) Find the value of $f(5)$ and $f(6)$ by Lagrange's interpolation method using the given data.

$$x : \quad 1 \quad 2 \quad 3 \quad 4 \quad 7$$

$$f(x) : 2 \quad 4 \quad 8 \quad 16 \quad 128$$

Or

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- (b) Find the value of $f(-0.5)$ using cubic spline method from the given data :

$$\begin{array}{l} x : \quad -1 \quad 0 \quad 1 \quad 2 \\ f(x) : -1 \quad 1 \quad 3 \quad 35 \end{array}$$

19. (a) Using the data given below, evaluate

$$\int_{0.5}^{1.1} x^2 y dx \text{ by (i) Trapezoidal rule and}$$

(ii) Simpson's one third rule.

$$\begin{array}{l} x : \quad 0.5 \quad 0.6 \quad 0.7 \quad 0.8 \quad 0.9 \quad 1.0 \quad 1.1 \\ y : 0.4804 \quad 0.5669 \quad 0.649 \quad 0.7282 \quad 0.7985 \quad 0.8658 \quad 0.9281 \end{array}$$

Or

- (b) Evaluate $y(1.1)$ by Runge-Kutta method of order four given that $y' = y^2 + xy$ and $y(1) = 1$.

20. (a) Write a program to find the solution of an equation by Bisection method.

Or

- (b) Write the algorithm and program in C to perform interpolation by Lagrange's method.