(6 pages)

DECEMBER 2015 **P/ID 40013/PPHN**

Time : Three hours Maximum : 100 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What are transcendental equations? Give examples.

2. What is the order of convergence of Newton-Raphson method?

3. What are eigenvalues and eigenvectors?

4. State the difference between power method and Jacobi's method of finding eigenvalue.

5. When will you use Newton's interpolation method and Lagrange's interpolation method?

6. State the principle of least squares fitting method.

7. Solve the equation $y' = x - y$ with the initial condition $y(0) = 1$ and find $y(0.1)$ by Euler's method.

8. Give the transformation equation to change the limits of integral $[a,b]$ into the interval $[-1,1]$ is Gaussian integration.

9. What are executable and non executable statements?

10. Write a flow chart to find $F = 1.8C + 32$.

PART B — (5 × 6 = 30 marks)

Answer ALL questions.

11. (a) Give the theory of Newton-Raphson method.

Or

(b) Explain the bisection method of finding the root of an equation.

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

Or

(b) Explain the Jacobi's method of finding the eigenvalues of a given matrix.

13. (a) Give the theory of least squares fitting method.

Or

(b) Derive the Lagrange's interpolation formula.

14. (a) Give the theory of Gauss-Hermite quadrature method for integration.

Or

(b) Derive the formulae for finding the integration of a function by Simpson's one-third rule.

15. (a) Give the differences between a function sub program and subroutine sub program.

Or

(b) Write a function sub program to solve the differential equation by Euler's method.

PART C — (5 × 10 = 50 marks)

Answer ALL questions.

16. (a) Find the root of the equation $e^x = 4x$ by Newton-Raphson method.

Or

(b) Find the root of the equation $x^3 - 9x + 1 = 0$ by bisection method correct to two decimal places.

17. (a) Find the largest eigenvalue and the corresponding eigenvector of the matrix $\begin{pmatrix} 4 & 2 \\ 1 & 3 \end{pmatrix}$ by power method.

Or

(b) Solve the system of given equations by Gauss elimination method.

$$2x + 3y - z = 5$$
$$4x + 4y - 3z = 3$$
$$2x - 3y + 2z = 2.$$

18. (a) Find the value of $y = e^{2x}$ when $x = 0.05$ by Newton's forward interpolation method. Construct the table of values of y corresponding to the values of $x = 0$, 0.1, 0.2, 0.3 and 0.4.

Or

(b) Find the value of $y(0.5)$ from the given table of data by cubic spline method. Given : $M_0 = M_2 = 0$

x :	0	1	2
y :	–5	–4	3

19. (a) Find the value of $y(0.7)$ for the given equation $y' = y - x^2$ by fourth order Runge-Kutta method. Given : $y(0.6) = 1.7379$.

Or

(b) Evaluate : $\int_{-3}^{3} x^4 \, dx$ by (i) Trapezoidal rule and (ii) Simpson's one-third rule.

20. (a) Write a program to solve the given equation by Newton-Raphson method.

Or

(b) Write a program to find the integral of a function by Trapezoidal rule.

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