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Total No. of Pages : 02

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B.Tech.(Aerospace Engg.) (2012 Onwards)/B.Tech.(ANE) (Sem.–4)

NUMERICAL ANALYSIS

Subject Code : ANE-204

Paper ID : [A1029]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. a) Find the truncation error for e^x at $x = \frac{1}{5}$ if first three terms are retained in expansion.

b) The function f(x)=$\tan^{-1} x$ can be expanded as :

$\tan^{-1} x = x - \frac{x^3}{3} + \frac{x^5}{5} - ....+(-1)^{n-1}\frac{x^{2n-1}}{2n+1} + ...$ find n such that series determines $\tan^{-1}(1)$ correct to eight significant digits.

c) Show that bisection method has linear order of convergence.

d) Write Newton's Gregory forward interpolation formula.

e) Write Newton-Cotes Quadrature formula.

f) Define ill-conditioned system of equation with example.

g) Explain pivoting and types of Pivoting.

h) Write classification of linear partial differential equation.

$$A\frac{\partial^2 u}{\partial x^2} + B\frac{\partial^2 u}{\partial x \partial y} + C\frac{\partial^2 u}{\partial y^2} + D\frac{\partial u}{\partial x} + E\frac{\partial u}{\partial y} + Fu = G$$

i) Write Newton's iterative formula for finding inverse of a number.

j) What is the difference between gauss -Seidal and gauss Jacobi's and which is fastest?

SECTION-B

2. Find the root of the equation 2x = cosx+3 correct to three decimal places using (i) iteration method (ii) Aitkin's Δ^2 method.

3. The function y = f(x) is given at the points (7,3),(8,1),(9,1) and (10,9).Find the value of y for x = 9.5 using Lagrange's interpolation formula.

4. Show that the LU decomposition method fails to solve the system of equations:

$$x_1 + x_2 - x_3 = 2$$

$$2x_1 + 2x_2 + 5x_3 = -3$$

$$3x_1 + 2x_2 - 3x_3 = 6$$

whose exact solution is (1,0,-1).

5. The velocity v(m/sec) of a car, t seconds after it starts from rest ,is shown as follows:

t:	0	12	24	36	48	60	72	84	96	108	120
v:	0	3.60	10.08	18.90	21.60	18.54	10.26	5.40	4.50	5.40	9.00

Find the distance travelled by the car in 2 minutes.

6. Determine values of y at the pivotal points of the interval (0, 1) if y satisfies the boundary value problem $y^{iv} + 81y = 81x^2$, $y(0) = y(1) = y''(0) = y''(1) = 0$ take (n=3).

SECTION-C

7. Using Milne's method, solve $\frac{dy}{dx} = 1 + y^2$ with $y(0) = 0$, $y(0.2) = 0.2027$, $y(0.4) = 0.4228$, $y(0.6) = 0.6841$, obtain $y(0.8)$, $y(1)$ and $y(-0.2)$.

8. Find all the Eigen values and corresponding Eigen vectors of the matrix

$$\begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$$ by Jacobi's method.

9. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ is $0 \le x \le 4, 0 \le y \le 4$ given that u(0,y) = 0, u(4,y) = 8+2y, $u(x,0) = \frac{x^2}{2}$, $u(x,4) = x^2$ Take h = k = 1 and obtain the result correct to two decimal places.