(24)

Exam.Code:0934
Sub. Code: 6976

1059

B.E. (Electrical and Electronics Engineering)
Fourth Semester
AS-401: Numerical Analysis

[Time A]llowed: 3 Hours **Max. Marks: 50**

[Note]: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Use of non-programmable calculator is allowed.

x-x-x

1. (a) If $(\sqrt{3}+\sqrt{5}+\sqrt{7})$ is rounded to four significant digits, then find the absolute error.
(b) Define the order of convergence of Newton-Rapson method.
(c) Solve the equations: $x^2+y=5,\ y^2+x=3$.
(d) Find the eigen values of $\begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$
(e) If λ is an eigen value of A, then show that $1/\lambda$ is an eigen value of A^{-1}. (5 × 2 = 10)

PART A

2. (a) Find the value of e^x using series expansion for $x = 0.5$ with an absolute error less than 0.005: (4)

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots$$

(b) Using bisection method find a real root of the equation $\cos x - xe^x = 0$ correct to four decimal places. (6)

3. (a) Find the root of $xe^x = 3$ by Regula falsi method correct to three decimal places. (5)
(b) Solve $x^3+2x^2+10x-20=0$ by Newton-Rapson method. (5)

4. (a) Using Newton's backward difference formulae, constrct an iterpolating polynomial of degree 3 for the data: $f(-0.75) = -0.0718125$, $f(-0.5) = -0.02475$, $f(-0.25) = 0.3349375$, $f(0) = 1.10100$. Hence find $f(-1/3)$. (5)
(b) Apply Hermite's formula to interpolate for sin(1.05) from the following data: (5)

x	$\sin x$	$\cos x$
1.00	0.84147	0.54030
1.10	0.89121	0.45360

PART B

5. (a) Solve by Gauss-Seidel method, the following system of equations: (5)

$$28x + 4y - z = 32,\ x + 3y + 10z = 24,\ 2x + 17y + 4z = 35$$

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(b) Find the largest eigen-value and the corresponding eigen-vector of the matrix using power method: (5)

$$\begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}$$

6. (a) Evaluate the following intergal using Simpson's 1/3rd rule. Compare the error with the exact value. (5)

$$I = \int_0^1 \frac{x^2}{1+x^3} dx$$

(b) Evaluate $\int_0^2 \frac{dx}{x^2+4}$ using Romberg's method. Hence obtain an approximate value of π. (5)

7. (a) Apply Taylor's method to obtain the approximate value of y at $x = 0.2$ for the differential equation $\frac{dy}{dx} = 2y + 3e^x$; $y(0) = 0$. Compare the numerical solution obtained with the exact solution. (5)

(b) Use the method of least squares to fit the straight line $Y = a + bX$ to the data (5)

x	1	2	3	4	5
y	14	27	40	55	68

x-x-x