D 27155 (Pages : 2) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2006

CH/AI/CE/EC/IC/ME/EE 2K 506A/PTME2K 505A/PTEE2K 504D—NUMERICAL ANALYSIS

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

1. (a) Find a real root of the equation $x^3 + x^2 - 1 = 0$ using Iteration method.

   (b) Find the smallest positive root of the equation $x^3 - 2x + 0.5 = 0$.

   (c) Solve by Gauss elimination method :

   $3x + y - z = 3$

   $2x - 8y + z = -5$

   $x - 2y + 9z = 8$.

   (d) Discuss in detail about error analysis.

   (e) Find $f(0.2)$ by a suitable formula from the table below :

x	:	0	1	2	3	4	5	6
$f(x)$	:	176	185	194	203	212	220	229

   (f) Find $y'(0)$ from the table below :

x	:	0	1	2	3	4	5
y	:	4	8	15	7	6	2

   (g) Find $y(0.1)$ using Taylor series method, given $y' = x + y, y(0) = 1$.

   (h) Find $y(0.1)$ using Improved Euler method, given $\frac{dy}{dx} = y - \frac{2x}{y}, y(0) = 1$.

(8 × 5 = 40 marks)

2. (a) (i) Find the root of the equation $\sin x = 1 + x^3$ between (–2, –1) to 3 decimal places by Newton's-Raphson method.

   (ii) Find all the roots of the equation $x^3 - 9x^2 + 18x - 6 = 0$ by Graeffe's method.

Or

   (b) (i) Find a root between 0 and 1 for $f(x) = 3x + \sin x - e^x$ using Muller's method.

   (ii) Explain the Bairstow method for finding quadratic factors.

3. (a) (i) Solve by Gauss-Seidel method the following system :—

   $8x - 3y + 2z = 20$

   $4x + 11y - z = 33$

   $6x + 3y + 12z = 35$

   (ii) Solve $x^2 + y^2 = 4$ and $e^x + y = 1$ using Newton-Raphson method with starting values $(x_0, y_0) = (1, -1.7)$ correct to two decimals.

Or

Turn over

(b) (i) Solve by Crout's method $x + y + z = 3$, $2x - y + 3z = 16$, $3x + y - z = -3$.

(ii) Find the eigenvalues (largest) and eigenvector for the matrix $A = \begin{bmatrix} 3 & -1 & 0 \\ -2 & 4 & -3 \\ 0 & -1 & 1 \end{bmatrix}$.

4. (a) (i) Find $y(21)$ and $y(28)$ from the following data :—

x	:	20	23	26	29
y	:	0.342	0.3907	0.4384	0.4848

(ii) Find $y(35)$ using Stirling's formula :

x	:	20	30	40	50
y	:	512	439	346	243

Or

(b) (i) Fit a polynomial to the data and find $y(1)$ using Lagrange's interpolation formula :

x	:	−1	0	2	3
y	:	−8	3	1	12

(ii) Evaluate $\int_0^2 \frac{dx}{1 + x + x^3}$ to 3 decimals by dividing the range of integration into 8 equal parts using Simpson's $\frac{1}{3}$ rule.

5. (a) (i) Using RK-method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ given $y(0) = 1$ at $x = 0.2, 0.4$.

(ii) Find $y(2)$, given $\frac{dy}{dx} = \frac{1}{2}(x + y)$; $y(0) = 2$; $y(0.5) = 2.636$; $y(1) = 3.595$ and $y(1.5) = 4.968$ using Milne's predictor formula.

Or

(b) (i) Using Adam's method, find $y(0.4)$ of given $\frac{dy}{dx} = \frac{1}{2}xy$, $y(0) = 1$, $y(0.1) = 1.01$, $y(0.2) = 1.022$ and $y(0.3) = 1.023$.

(ii) Solve $u_t = u_{xx}$ subject to $u(0, t) = 0$, $u(1, t) = 0$ and $u(x, 0) = \sin \pi x$, $0 < x < 1$, using Bender-Schmidt formula.

(4 × 15 = 60 marks)