D 42192 (Pages 3)

Name.....

Reg. No.....

MR

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2007

ME 04 501/AM 04 501—COMPUTATIONAL METHODS IN ENGINEERING

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

I. (a) Find a real root of the equation $x^3 - 2x - 5 = 0$ using the method of false position.

(b) Define absolute error and relative error.

(c) Solve by Gauss Jordan method :

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

(d) Find the eignevalues and corresponding eignevectors of the matrix $\begin{bmatrix} 0 & 1 & 4 \\ 1 & 3 & 1 \\ 2 & 1 & 0 \end{bmatrix}$.

(e) Distinguish between the forward difference operator and backward difference operator.

(f) Evaluate $\int_0^1 \frac{dx}{1+x^2}$, using trapezoidal rule.

(g) Find $y(0.1)$ by Taylor series method $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 0$.

(h) Explain the Milne's method for solving differential equation.

($8 \times 5 = 40$ marks)

II. (a) (i) Find by Newton's method, the real root of the equation $xe^2 - 2 = 0$ correct to 3 decimal places.

(7 marks)

(ii) Find the real root of the equation $x^3 - 6x^2 + 11x - 6 = 0$ using Graeffe's root squaring method.

(8 marks)

Or

Turn over

(b) Obtain the quadratic factor of the polynomial $x^3 + x + 10$ using Bairstow's method with starting values 1.8 and – 1.

(15 marks)

III. (a) (i) Solve the system by Gauss Seidel method :

$$x + 4y - z = -5$$
$$x + y - 6z = -12$$
$$3x - y - z = 4$$

(7 marks)

(ii) Solve the system by Crout's method :

$$3x + 2y + 7z = 4$$
$$2x + 3y + z = 5$$
$$3x + 4y + z = 7$$

(8 marks)

Or

(b) Solve by relaxation method :

$$9x - 2y + z = 50$$
$$x + 5y - 3z = 18$$
$$-2x + 2y + 7z = 19$$

(15 marks)

IV. (a) (i) Evaluate $f(9)$ using Lagrange's interpolation formula :

x	...	5	7	11	13	17
$f(x)$	...	150	392	1452	2366	5202

(7 marks)

(ii) Find $e^{1.85}$ from the following data :—

x	...	1.7	1.8	1.9	2	2.1	2.2
e^x	...	5.474	6.05	6.686	7.389	8.166	9.025

(8 marks)

Or

(b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.1, 1.3, 1.6$ for the following data :

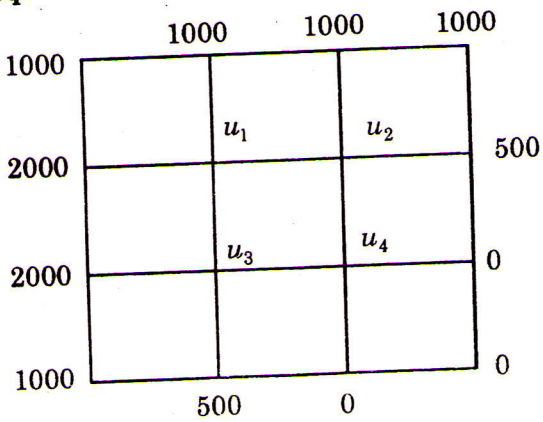
x	...	1	1.1	1.2	1.3	1.4	1.5	1.6
y	...	7.989	8.403	8.781	9.129	9.451	9.75	10.031

(15 marks)

V. (a) Solve by Runge-Kutta fourth order Formula $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 1$. Find $y(0.1)$, $y(0.2)$ and $y(0.3)$ with $h = 0.1$.

Or

(b) Solve the Laplace equation :



(15 marks)

[4 × 15 = 60 marks]