C 5453 (Pages 3) Name.................................

Reg. No.................................

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2010

EC/IC/AI 04 705 F—NUMERICAL ANALYSIS

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Section I

I. 1 Show that the equation $\log_e x = x^2 - 1$ has exactly two real roots between 0.45 and 1.

2 Find an interactive formula to find $\sqrt{N}$ where N is a positive number and hence find $\sqrt{5}$.

3 Explain the convergence of relaxation method.

4 Find the largest eigen value of $\begin{bmatrix} 4 & 1 \\ 1 & 3 \end{bmatrix}$ by power method.

5 Prove that $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1 + \frac{\delta^2}{4}}$.

6 Obtain the function whose first difference is $9x^2 + 11x + 5$.

7 Using Taylor series method compute the solution of $y' = x + y$, $y(0) = 1$ at $x = 0.2$ correct to three decimal places.

8 Explain Milne's predictor corrector method.

(8 × 5 = 40 marks)

Section II

II. (a) (i) Solve $xe^x - 2 = 0$ correct to three decimal places by Newton-Raphson method. (7 marks)

(ii) Starting with $x_0 = 4.5$, $x_1 = 5.5$ and $x_2 = 5$ solve $x^3 - 13x - 12 = 0$ by Muller's method.

(8 marks)

Or

[redacted]

Turn over

(b) (i) Find a real root of the equation $2x - \log x = 6$ correct to three decimal places by method of false position.

(7 marks)

(ii) Use Bairstow's method to determine the roots of $0.7x^3 - 4x^2 + 6.2\,x - 2 = 0$. (8 marks)

III. (a) (i) Solve $x - y + z = 1$, $3x - 2y + 3z = 6$, $2x - 5y + 4z = 5$ by Gauss Jordan method. (7 marks)

(ii) Solve $5x + 2y + z = 12$, $x + 4y + 2z = 15$, $x + 2y + 5z = 20$ by Jacobi's method. (8 marks)

Or

(b) (i) Solve the system :

$x + y + z = 2$, $2x + 3y - 2z = -4$, $x - 2y + 4z = 17$ Crout's method.

(7 marks)

(ii) Solve the system of non-linear equations $x^2 + y = 11$, $y^2 + x = 7$. (8 marks)

IV. (a) (i) Find the missing term in the following table :—

x :	1	2	3	4	5	6	7
y :	2	4	8	—	32	64	128

(7 marks)

(ii) Find the value of cos (1.747) using the values given in the table below :

x :	1.7	1.74	1.78	1.82	1.86
y :	0.9916	0.9857	0.9781	0.9691	0.9584

(8 marks)

Or

(b) (i) Use Lagrange's interpolation formula to find $f(x)$ given :

$f(5) = 12$ $f(6) = 13$, $f(9) = 14$ and $f(11) = 16$.

Also find $f(10)$.

(7 marks)

(ii) Use Trapezoidal rule to evaluate $\int_0^1 x^3\,dx$ considering fire subintervals. (8 marks)

V. (a) Solve the initial value problem $\frac{dy}{dx} = x^2 - y$; $y(0) = 1$ to find $y(0.4)$ using Adam's Bashforth method starting solutions required are to be obtained using Runge-Kutta method of order 4 using step value $h = 0.1$.

Or

[redacted]

(b) Solve the boundary value problem :

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

Using the condition $u(0, t) = 0$, $u(1, t) = 0$ and $u(x, 0) = \sin \pi x \quad 0 \leq x \leq 1$ taking $h = 0.2$ and $k = 0.02$.

(15 marks)

[4 × 15 = 60 marks]

[redacted]