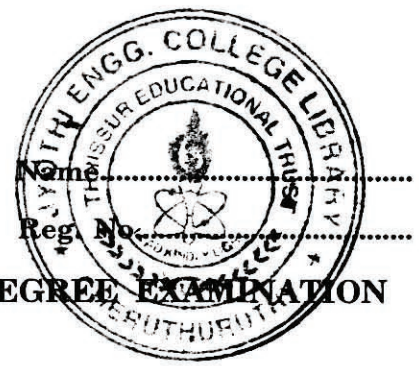


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SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
MAY 2013

EC/IC/AI 04 705 F—NUMERICAL ANALYSIS

(2004 Admissions)

Time : Three Hours

Maximum : 100 Marks

Answer all questions.

Part A

- I. (a) Find the real root of $3x - \cos x - 1 = 0$ by Newton's method, correct to 4 decimal places.
(b) Solve for a positive root of $x = \cos x$ by false position method.
(c) Solve by Gauss elimination method :

$$\begin{aligned}x + y + z + w &= 2 \\2x - y + 2z - w &= -5 \\3x + 2y + 3z + 4w &= 7 \\x - 2y - 3z + 2w &= 5.\end{aligned}$$

- (d) Solve :

$$\begin{aligned}10x - 5y - 2z &= 3 \\4x - 10y + 3z &= -3 \\x + 6y + 10z &= -3\end{aligned}$$

by Gauss-Seidel method. (only 3 iterations)

- (e) Discuss the truncation error in Simpson's formula.

- (f) Evaluate $\int_0^6 \frac{dx}{1+x}$ by Trapezoidal rule and Simpson's rule.

- (g) Solve for $y(0.01)$ and $y(0.02)$ given $\frac{dy}{dx} + y = 0$ and $y(0) = 1$ by Euler method.

- (h) Derive Bender-Schmidt recurrence equation in solving $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$.

(8 × 5 = 40 marks)

Turn over

Part B

- II. (a) If N is a positive number, derive iterative formulae to obtain \sqrt{N} and $\frac{1}{N}$ and hence evaluate $\sqrt{5}$ and $\frac{1}{19}$.

Or

- (b) Solve $x^3 - 9x^2 + 18x = 6$ by Graeffe's method (3 squarings).

- III. (a) Using power method, find all the eigen values of $\begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$.

Or

- (b) By Crout's method, solve :

$$2x + 3y + z = -1$$

$$5x + y + z = 9$$

$$3x + 2y + 4z = 11.$$

- IV. (a) Using Stirlings formula find $y(1.22)$ from the table below :

x :	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y :	0.8415	0.8912	0.9320	0.9636	0.9855	0.9975	0.9996

Or

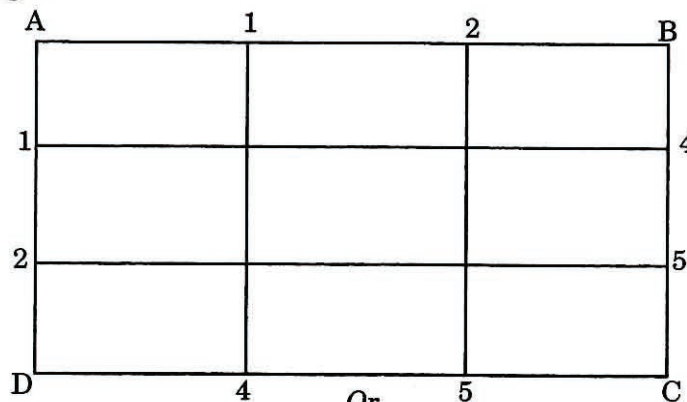
- (b) From the table below, find $f(x)$ and $f(6)$ using Newton's interpolation formula.

x :	1	2	7	8
$f(x)$:	1	5	5	4

- V. (a) (i) Using Runge-Kutta method of 4th order find $y(0.2)$ given $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, $y(0) = 1$ taking $h = 0.2$.

(8 marks)

- (ii) Solve $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown below in the figure.



Or

(7 marks)

(b) (i) Compute $y(0.25)$ by modified Euler method given $\frac{dy}{dx} = 2xy$, $y(0) = 1$.

(8 marks)

(ii) Solve $\frac{\partial^2 u}{\partial x^2} = 16 \frac{\partial u}{\partial t}$, $0 < x < 1$, $t > 0$ given $u(x, 0) = 0$, $u(0, t) = 0$; $u(1, t) = 100t$. Compute u for one step in t direction taking $h = \frac{1}{4}$.

(7 marks)

[4 × 15 = 60 marks]