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12MTP11

First Semester M.Tech. Degree Examination, February 2013

Applied Mathematics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Write a note on types of errors involved in numerical calculation. **(06 Marks)**

b. Find the binary form of the number 193. **(04 Marks)**

c. Test for consistency and solve $2x+y+z=10$, $3x+2y+3z=18$, $x+4y+9z=16$ by Gauss-Jordan method. **(10 Marks)**

2 a. Find the LU decomposition of the matrix $[A]=\begin{bmatrix}2 & -1 & 1\\ 4 & 3 & -1\\ 3 & 2 & 2\end{bmatrix}$ using Cront's method. **(08 Marks)**

b. Find the solution of the system of equations by Cramer's rule. $5x-7y+z=11$, $6x-8y-z=15$, $3x+2y-6z=7$. **(06 Marks)**

c. Decompose the matrix $A=\begin{bmatrix}4 & -1 & 1\\ -1 & 6 & -4\\ 1 & -4 & 5\end{bmatrix}$ using the relation $A=[U]^T[U]$. **(06 Marks)**

3 a. Using Jacobi method, find all the eigen values and corresponding eigen vectors of the matrix $A=\begin{bmatrix}1 & \sqrt{2} & 2\\ \sqrt{2} & 3 & \sqrt{2}\\ 2 & \sqrt{2} & 1\end{bmatrix}$. **(10 Marks)**

b. Define a sturm sequence. Solve by 'power' method and obtain largest eigen value of the matrix $A=\begin{bmatrix}1 & 6 & 1\\ 1 & 2 & 0\\ 0 & 0 & 3\end{bmatrix}$ and initial value $[X_0]=\begin{bmatrix}1\\ 0\\ 0\end{bmatrix}$ and obtain the remaining eigen values. **(10 Marks)**

4 a. Given that

x	0.2	0.4	0.6	0.8
f(x)	0.0016	0.0256	0.1296	0.4096

Find $f'(x)$, $f''(x)$ and $f'''(x)$ at $x=0.3$. **(12 Marks)**

b. Evaluate $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$, $\frac{\partial^2 f}{\partial x^2}$, $\frac{\partial^2 f}{\partial y^2}$ and $\frac{\partial^2 f}{\partial x \partial y}$ for the function, $f(x, y)=2x^4y^3$ at $x=1$, $y=1$ with a step size as $\Delta x=\Delta y=0.1$. **(08 Marks)**

5 a. Determine the value of the integral $\int_1^2 \frac{dx}{1+x}$ using combined Trapezoidal and Romberg integration rule, upto an accuracy of 4 decimal places. **(10 Marks)**

5 b. A rocket is launched from the ground, it's acceleration 'a' is noted during first 1 minute and is given in the following table. Find the velocity of the rocket at first minute by using Simpson's 3/8[th] rule.

Time (in secs)	0	10	20	30	40	50	60
Accn (cms/sec^2)	30	31.63	33.54	35.57	37.75	40.33	43.25

(10 Marks)

6 a. Find the solution of the initial value problem $2\frac{dy}{dx} = 4x + 2y$, $y(1) = 3$ for $x = 1\ (0.1)\ 1.2$ using Runge-Kutta 2[nd] order and 4[th] order methods. **(10 Marks)**

b. Solve the given differential equation $\frac{dy}{dx} = 1 + \frac{y}{x}$ given y = 2 at x = 1 by taking step size h = 0.2 and determine y at x = 1.4 by using modified Euler method. Perform 2 iterations at each step. **(10 Marks)**

7 a. Given $y' = y + 2x - 1$ and

x	0	0.1	0.2	0.3
y	1	1.01034	1.04280	1.09971

Determine y(0.4) using Adam's predictor and corrector formulae correct upto 5[th] decimal place of accuracy. **(10 Marks)**

b. Explain the Shooting methods. **(10 Marks)**

8 a. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = +10(x^2 + y^2 + 10)$ over the square with x = 0 = y; x = 3 = y; with u = 0 on the boundary and mesh length = 1. **(10 Marks)**

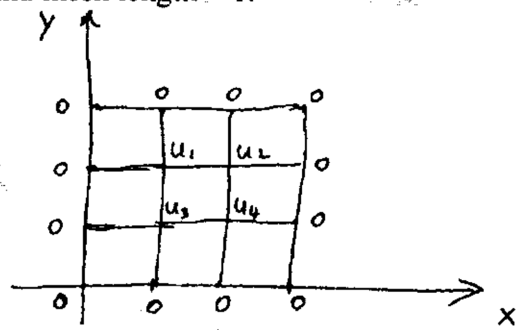

Fig.Q8(a)

b. Find the values of u(x, t) satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4\frac{\partial^2 u}{\partial x^2}$ with boundary conditions u(0, t) = 0 = u(5, t) and $u(x, 0) = 4x - \frac{1}{2}x^2$ at the points x = i; i = 0, 1, 2, 3, 4 and $t = \frac{1}{5}j$; j = 0, 1, 2. **(10 Marks)**

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