CBCS SCHEME

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15CV663

Sixth Semester B.E. Degree Examination, June/July 2018
Numerical Methods and Applications

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Using fixed point iteration method, find real root of $2x - \log_{10} x = 7$. **(08 Marks)**

b. Solve, by Jacobi's iteration method, the equations $20x + y - 2z = 17$; $3x + 20y - z = -18$, $2x - 3y + 20z = 25$. **(08 Marks)**

OR

2 a. Using Gauss-Jordan method, find the inverse of the matrix.

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}.$$ **(08 Marks)**

b. Solve the equations $27x + 6y - z = 85$, $x + y + 54z = 110$; $6x + 15y + 2z = 72$, by Gauss-Seidel method. **(08 Marks)**

Module-2

3 a. Find the missing term in the following table using interpolation formula:

x	0	1	2	3	4
y	1	3	9	-	81

(08 Marks)

b. Find the cubic polynomial which takes the following values:

x	0	1	2	3
f(x)	1	2	1	10

And hence evaluate f(4). **(08 Marks)**

OR

4 a. Evaluate f(9) using Newton's divided difference formula.

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

(08 Marks)

b. Find the cubic splines for the following data

x	1	2	3
y	-6	-1	16

Take $M_0 = M_2 = 0$. **(08 Marks)**

Module-3

5 a. The following data gives the velocity of a particle for 20 seconds at an interval of 5 seconds. Find the initial acceleration using the entire data:

Time t(sec)	0	5	10	15	20
Velocity v(m/sec)	0	3	14	69	228

(08 Marks)

b. Evaluate $\int_0^1 \left(\frac{1}{1+x}\right) dx$, using Romberg's method. **(08 Marks)**

OR

6 a. Evaluate $\int_{0.2}^{1.4}(\sin x - \log x + e^x)\,dx$, using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule, taking 7 ordinates. **(08 Marks)**

b. Using trapezoidal rule, evaluate $I = \int_{1}^{1.4}\int_{2}^{2.4}\left(\frac{1}{xy}\right)dx\,dy$, taking 4 sub interval. **(08 Marks)**

Module-4

7 a. Using Taylor's series method, compute y at x = 0.1 and x = 0.2. Given that $\frac{dy}{dx} = x + y$; y(0) = 1. **(08 Marks)**

b. Compute y at x = 0.8 by Adams Basforth method: Given $\frac{dy}{dx} = x - y^2$; y(0) = 0, y(0.2) = 0.02, y(0.4) = 0.0795, y(0.6) = 0.1762. **(08 Marks)**

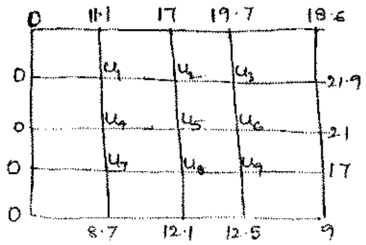
OR

8 a. Apply Runge-Kutta fourth order method to find value of y at x = 0.4 given that $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with y(0) = 1 (taking h = 0.2). **(08 Marks)**

b. If $\frac{dy}{dx} = 2e^x - y$; y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.040; y(0.3) = 2.090. Find y(0.4) by using Milne's predictor corrector method. **(08 Marks)**

Module-5

9 a. Solve the Laplace equation $u_{xx} + u_{yy} = 0$ given that



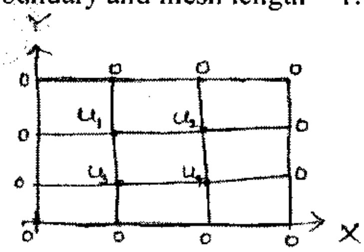
(08 Marks)

b. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in 0 < x < 5, t ≥ 0 given that u(x, 0) = 20, u(0, t) = 0, u(5, t) = 100. Compute u for the time-step with h = 1 by Crank-Nicholson method. **(08 Marks)**

OR

10 a. Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = 4\frac{\partial^2 u}{\partial x^2}$; subject to condition u(0, t) = 0; u(4, t) = 0; $u_t(x, 0) = 0$ and u(x, 0) = x(4-x) by taking h = 1, k = 0.5 upto 4 steps. **(08 Marks)**

b. Solve the equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides x = 0, y = 0, x = 3, y = 3 with u = 0 on the boundary and mesh length = 1. **(08 Marks)**



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