CBCS Scheme

Sixth Semester B.E. Degree Model Question Paper
Numerical Methods and Applications (15CV663)

Time: 3 hrs. Max. Marks: 80

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

Module -1

1 a. Using Newton-Raphson method $2x = \cos x + 3$ with initial value of x = 1.5. **(05 Marks)**

b. Solve the following equations by Gauss-elimination method: **(06 Marks)**

$$x_1 + x_2 + x_3 = 9$$
$$x_1 - 2x_2 + 3x_3 = 8$$
$$2x_1 + x_2 - x_3 = 3$$

c. Solve the following equations by Gauss-Jacobi method: **(05 Marks)**

$$20x_1 + x_2 - 2x_3 = 17$$
$$3x_1 + 20x_2 - x_3 = -18$$
$$2x_1 - 3x_2 + 20x_3 = 25$$

OR

2 a. Use Fixed point iteration technique to solve $\cos x = xe^x$ with initial value of x = 0.5. **(06 Marks)**

b. Solve the following equations by Gauss-Jordan method: **(05 Marks)**

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

c. Find the inverse of the matrix using by Gauss-Jordan method: A = $\begin{bmatrix} 2 & 1 & 4 \\ 1 & -3 & -1 \\ 3 & -2 & 2 \end{bmatrix}$ **(05 Marks)**

Module -2

3 a. From the following estimate the number of students who obtained marks between 40 and 45: **(05 Marks)**

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

b. Find Lagrangian interpoplation polynomial from: y(1) = -3, y(3) = 0, y(4) =30, y()6) = 132.
Find y(5). **(06 Marks)**

c. Evaluate f(45) from the following data: **(05 Marks)**

x	10	20	30	40	50
f(x)	46	66	81	93	101

OR

4 a. Using Newton's divided difference method evaluate f(8) and f(15) from data: **(06 Marks)**

x	4	5	7	10	11	13
f(x)	48	100	297	900	1210	2028

b. Fit the cubic spline from the (1, 1), (2, 2), (3, 5), (4, 11). Evaluate f(1.5) . **(10 Marks)**

Module -3

5 a. Determine $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 1.1 and x = 1.6 from the following data. **(07 Marks)**

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

b Estimate $\int_0^2 e^{x^2} dx$ taking 10 intervals by (i) Trapezoidal formula (ii) Simpson's 1/3rd Fformula.

(09 Marks)

OR

6 a. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Romberg's method. **(07 Marks)**

b. Compute $\int_0^{\pi/2} \int_0^{\pi/2} \sqrt{\sin(x+y)}\,dxdy$ using Trapezoidal method. **(09 Marks)**

Module -4

7 a. Using Taylor's series solve $\frac{dy}{dx} = x^2y - 1$ given y(0) =1. Compute y(0.1) and y(0.2) **(07 Marks)**

b. Given $\frac{dy}{dx} = x^2(1+y)$ with y(1) = 1. Compute y(1.4) using Adams Bashforth method

(09 Marks)

OR

8 a. Using Runge-Kutta forth order method solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with y=1 when x=0. Find y(x=0.2) taking h=0.2 **(08 Marks)**

b. Using Modified Euler's method find y(20.2) and y(20.4) given that $\frac{dy}{dx} = \log_{10}\left(\frac{x}{y}\right)$ with y(20) = 5 c and taking h=0.2. **(08 Marks)**

Module -5

9 a. Find y(0.25), y(0.5) and y(0.75) satisfying $\frac{d^2y}{dx^2} + y = x$ with boundary conditions y(0) = 0 and y(1) = 2. **(07 Marks)**

b. Solve $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values given in Fig. Q 9(b). Compute u_1 to u_9 up to 3 iterations. **(09 Marks)**

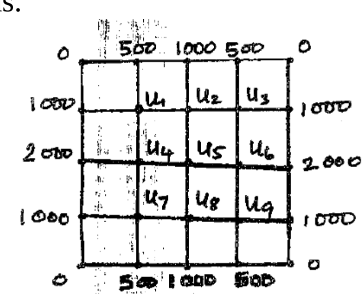

Fig. Q9(b)

OR

10 a. Solve the equation $u_t = u_{xx}$ subjected to the conditions $u(0,t) = u(1,t) = 0$, $u_t(x,0) =$ sin (πx) for $0 \leq t \leq 0.1$ by taking $h = 0.2$ **(08 Marks)**

b. Using finite difference equation, solve $\frac{d^2u}{dt^2} = 4\frac{d^2u}{dx^2}$ subjected to $u(0,t) = u(4,t) = 0$, $u_t(x,0) = 0$ and $u(x,0) = x(4-x)$ upto 4 steps. Choose $h = 1$ and $k = 0.5$. **(08 Marks)**

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