MANAV RACHNA vidyanatariksha | MANAV RACHNA UNIVERSITY (FORMERLY MANAV RACHNA COLLEGE OF ENGINEERING NAAC ACCREDITED 'A' GRADE INSTITUTION)

Declared as State Private University under section 2f of the UGC act, 1956

DEPARTMENT OF MATHEMATICS

"T3Examination, May 2017-18"

Semester:4th

Subject:Numerical Analysis

Branch: Physics

Course Type: Core

Time: 3 Hours

Max.Marks: 80

Date of Exam:15/05/2018

Subject Code:MAH411-T

Session: I

Course Nature: Hard

Program: B.Sc

Signature: HOD/Associate HOD:

Note: All questions are compulsory from part A (2*10 = 20 Marks). Attempt any two questions from Part B (15 Marks each). Attempt any two Questions from Part -C (15 Marks each).

PART -A

Q.1 (a) What are the limitations of Taylor's series Method for solving ordinary differential equation.

(b) What are direct methods and iterative method to solve the system of linear equation?

(c) Define Runge-Kutta Method.

(d) Define Eigen values and Eigen vectors.

(e) Using Euler's method, find approximate value of y when x = 1 of $\frac{dy}{dx} = x + y, y(0) = 1$ (take h = 0.2).

(f) Explain Gauss Elimination method.

(g) In Jacobi's method how to find θ and the value of θ lies between ………… θ …………..

(h) What is the difference between Initial value problem and final value problem.

(i) Find by Taylor's Series method the value of y at x = 0.1 and x = 0.2 from $\frac{dy}{dx} = x^2y - 1, y(0) = 1$.

(j) To apply both Milne's and Adam's Bash forth methods, we require how many starting values of y and the value of y are calculated by means of which methods?

PART - B

Q.2 (a) Solve the system by iterative method (5)

$$20x + y - 2z = 17, 3x + 20y - z = -18, 2x - 3y + 20z = 25$$

(b) Solve the equation

$$3x + 2y + 7z = 4$$

$$2x + 3y + z = 5$$

$$3x + 4y + z = 7$$

By UV Factorization Method. (7)

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Q.3 (a) Determine the largest Eigen value and the corresponding Eigen vector of the matrix

$$A = \begin{matrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{matrix}$$ (5)

(b) Transform the matrix to tri-diagonal from using Given's method. (10)

$$A = \begin{matrix} 2 & 1 & 3 \\ 1 & 4 & 2 \\ 3 & 2 & 3 \end{matrix}$$

Q.4 (a) Using Jacobi's method, find all the eigen values and the eigen vectors of the matrix. (8)

$$A = \begin{matrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{matrix}$$

(b) Using Gauss Elimination method, solve the equation:

$$2x + 2y + z = 12$$

$$3x + 2y + 2z = 8$$

$$5x + 10y - 8z = 10$$ (7)

PART -C

Q.5 (a) Using Runge-Kutta method of order 4, solve for y at x = 1.2 from $\frac{dy}{dx} = \frac{2xy+ e^x}{x^2+xe^x}$ given $x_0 = 1$, $y_0 = 0$, also find 'y' at x = 1.4 (8)

(b) Given $\frac{dy}{dx} = x^2(1+y)$ and $y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979$. Evaluate y(1.4), by Adams-Bashforth method. (7)

Q.6 (a) Using Picard's method, Solve $\frac{dy}{dx} = -xy$ with $x_0 = 0$, $y_0 = 1$ upto third approximation. (5)

(b) Using Euler's modified method, obtain a solution of the equation $\frac{dy}{dx} = \log(x+y)\,, y(0) = 2$ at x = 1.2 and 1.4 with h = 0.2 (10)

Q.7 Using Rune-Kutta method of order 4, Calculate y(0.1), y(0.2) and y(0.3) given that $\frac{dy}{dx} = 1 + \frac{2xy}{1+x^2}$, y(0) = 0, taking these values as starting values, find y(0.4) by Milne's method. (15)

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