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Examination Session June-2022

(Fourth Semester)

MT-608

M.A./M.Sc. MATHEMATICS (MSCMT/MAMT)

[Numerical Analysis - II]

Time : 2 Hours] **[Max. Marks : 40**

Note : This paper is of Forty (40) marks divided into two (02) Section A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION—A

(Long-Answer-Type Questions)

Note : Section 'A' contains five (05) long-answer-type questions of Ten (10) marks each. Learners are required to answer any two (02) questions only. 2×10=20

1. Solve the BVP :

$$\frac{d^2y}{dt^2} \quad y, y(0) \quad 0, y(1) \quad 1.1752$$

by shooting method together with Runge-Kutta method.

2. Explain Gram-Schmidt Orthogonalizing Process.

3. Solve by Milne's method :

$$\frac{dy}{dt} \quad \frac{t}{y}, y(1) \quad 2, t \quad [1,1.4]$$

4. Solve the boundary value problem

$$\frac{d^2y}{dx^2} \quad (1 \quad x^2)y \quad 1 \quad 0, x \quad [0,1]$$

by a second order finite difference method with step size $h = \frac{1}{4}$.

5. Fit a curve of the form $h = ax^b$ to the given data :

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5

8. Solve the boundary value problem :

$$\frac{d^2y}{dx^2} \quad y \qquad y(0) = 0, y(1) = 1.2$$

by employing shooting method, take $y'(0) = 0.85, 0.95$ as initial guesses.

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SECTION—B

(Short-Answer-Type Questions)

Note : Section 'B' contains eight (08) short-answer-type questions of Five (05) marks each. Learners are required to answer any four (04) questions only. 4×5 = 20

1. Solve the BVP by Numerov method :

$$\frac{d^2y}{dx^2} \quad x \quad y \qquad y(0) = 0, y(1) = 0$$

with step size $h = \frac{1}{4}$.

2. Obtain a second degree polynomial approximation to the function $f(x) = \frac{1}{1 \quad x^2}$, $x \in [1, 1.2]$ using Taylor series expansion about $x = 1$. Find a bound on the truncation error.

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3. Compute $y(0.2)$ by Taylor's series, where $y(t)$ is the solution of the IVP, $\frac{dy}{dt} \quad t \quad y, y(0) \quad 1$.

4. Explain Least Square Principle for Continuous functions.

5. Use Picard's method to compute $y(t)$ given that :

$$\frac{dy}{dt} \quad \frac{e^{\ t}}{y}$$

$y(0) = 2$.

6. Solve the BVP :

$y'' = 2, y(0) = y'(0) = y(1) = y'(1) = 0$

7. Explain stability analysis of :

(a) Euler's Method

(b) Runge-Kutta method of order two

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