

[2]

$y'' - xy = 0$, subject to the boundary conditions
 $y(0) + y'(0) = 1$, $y(1) = 1$, taking $h = \frac{1}{3}$. 8

Part – II (8 Marks)

Answer *any one* question.

1. The system of equations

$$\begin{aligned}x^2y + y^3 &= 10 \\xy^2 - x^2 &= 3\end{aligned}$$

has a solution near $x = 0.8$, $y = 2.2$. Perform two iterations of the Newton's method to obtain the root. 8

2. Find the solution of the Volterra integral equation

$$f(x) - \int_0^x (1 + 2x - 3u)f(u)du = x + \frac{2}{3}x^3$$

for $x = 0(0.2)0.4$, approximating the integral by Trapezoidal rule. 8

Ex/SC/MATH/PG/DSE/TH/05A/2022

M. Sc. MATHEMATICS EXAMINATION, 2022

(2nd Year, 2nd Semester)

NUMERICAL ANALYSIS II (THEORY)

PAPER – DSE 05A

Time : 1 hour 15 minutes

Full Marks : 24

Use a separate answer script for each Part.

Part – I (16 Marks)

Answer *any two* questions.

1. i) What is CFL conditon?
- ii) Solve numerically the wave equation

$$\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}; 0 < x < 1, t > 0;$$

subject to the boundary and initial conditions

$$u(0, t) = 0, u(1, t) = \frac{1}{2} \sin \pi t, u(x, 0) = u_t(x, 0) = 0.$$

Find the results for three time level taking
 $h = k = 0.25$. 2+6

2. Write finite difference approximation (FTCS) for the parabolic equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ and discuss the stability of the scheme. 8
3. Using finite difference method, solve the following boundary value problem:

[Turn over