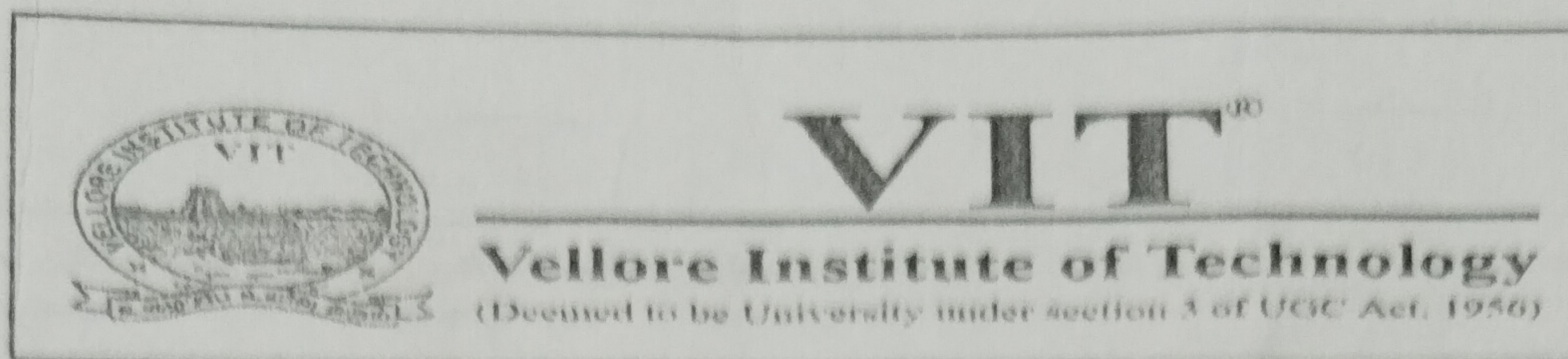




Department of Mathematics
School of Advanced Sciences
Fall Semester 2023-2024
Continuous Assessment Test-II

Slot: C2+TC2+TCC2

Max. Marks: 50M

Course Code: BMAT203L

Course Title: Linear Algebra and Differential Equations

Date: 17.10.2023

Time: 9:30AM-11:00AM

Faculty Name(s): Dr. K. Aruna, Dr. Raghavendar K

Class Number(s): 2192, 2193

Programme Name & Branch: B.Tech & BBT

Exam Duration: 90 Min

Answer all the questions. Each question carries 10 marks.

1. Using the method of separation of variables, solve the initial-value problem

$$\frac{dy}{dx} = (2x + 3)(y^2 - 4), \quad y(0) = 1. \quad \checkmark$$

2. Consider the following autonomous differential equation

$$\frac{dy}{dx} = y^3 - 5y^2 + 4y.$$

(a) Classify the equilibrium points.

(b) Draw the phase line.

3. A radioactive substance has a half-life of 1620 years.

(a) If its mass is now 4 g (grams), how much will be left 810 years from now?

(b) Find the time t when 1.5 g of the substance remain.

4. Solve the following system of first order ODE

$$\begin{aligned} \frac{dy}{dt} &= y \\ \frac{dx}{dt} &= x + 3y \end{aligned}$$

with the initial conditions $x(0) = 0, y(0) = 1$.

5. Consider the two first order ODE equations from the Van der Pol equation

$$\begin{aligned} \frac{dx}{dt} &= y \\ \frac{dy}{dt} &= -x + (1 - x^2)y \end{aligned}$$

Assume $x(0) = 1, y(0) = 1$ and $\Delta t = 0.25$ to find $x(1)$ and $y(1)$ using Euler's method.