VIT

Vellore Institute of Technology

Winter Semester-2022-2023

Continuous Assessment Test –I

Slot: C1+TC1+TCC1

Exam Duration: 90 minutes **Maximum Marks: 50**

Course Code: BMAT102L **Course Title: Differential Equations & Transforms**

Answer all the questions
(Each question carries 10 marks)

SET-1

1. Apply the method of undetermined coefficients, to solve the differential equation $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 8y = e^x + \cos x$ given that $y(0) = 4$ and $y'(0) = 1$.
2. Use the method of variation of parameters, to solve the differential equation $x^2\frac{d^2y}{dx^2} + 10x\frac{dy}{dx} + 8y = x^2$
3. A 128-lb weight is attached to a spring having a spring constant of 64 lb/ft. The weight is started in motion with no initial velocity by displacing it 6 inches above the equilibrium position and by simultaneously applying to the weight an external force $F(t) = 8 \sin 4t$. Assuming no air resistance, find the subsequent motion of the weight.
4. (a) Obtain the partial differential equation by eliminating the arbitrary function from $\phi(x^2 + y^2 + z^2, z^2 - 2xy) = 0$ (5 M)

   (b) Solve $q^2 = z^2p^2(1 - p^2)$ (5 M)

5. Solve $4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u, u(0, y) = 3e^{-y} - e^{-5y}$ using the method of separation of variables.