REG.NO.: 24BME0702

VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - I
WINTER SEMESTER 2024-2025

SLOT: A2 + TA2 + TAA2

Programme Name & Branch	: B.Tech. Common
Course Code and Course Name	: BMAT102L Differential Equations and Transforms
Faculty Name(s)	:
Class Number(s)	:
Date of Examination	: Jan 27, 2025 at 2 pm
Exam Duration	: 90 minutes

Maximum Marks: 50

General instruction(s):

- Answer all questions.
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyze, 5 – Evaluate, 6 – Create)

Q. No.	Question	M	CO	BL
1.	Using the method of undetermined coefficients, solve the IVP $x'' + x = 2\cos t,\ x(0) = 0,\ x'(0) = 0.$	10	1	2
2.	Find the general solution of $x^2y'' - xy' - 3y = 2x^3.$	10	1	2
3.	Consider an LRC circuit $Lq''(t) + Rq'(t) + \frac{1}{C}q(t) = V(t),$ with $L = 1.00\ H,\ R = 10^2\ \Omega,\ C = 10^{-4}\ f,\ V(t) = 10^3\ V.$ Suppose that no charge is present and no current is flowing at time $t = 0$ when a battery of voltage $V(t)$ is inserted. Find the current and the charge on the capacitor as functions of time.	10	1	3
4a.	Form the PDE by eliminating the arbitary function from $F\left(\frac{z}{x+y}, xy + yz + zx\right) = 0.$	5	2	2
4b.	Find the general solution of the Lagranges' equation $x(y^2 + z)z_x - y(x^2 + z)z_y = (x^2 - y^2)z.$	5	2	3
5.	Using separation of variables, solve the PDE $z_x = 3z_t + z,\ z(x, 0) = 3e^{-2x}.$	10	2	3