



VIT

Vellore Institute of Technology
Vellore, Tamil Nadu, India

SLOT: C2+TC2+TCC2

REG.NO.:

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

Programme Name & Branch : B. Tech
Course Code : BMAT102L
Course Name : Differential Equations and Transforms
Faculty Name(s) : Common question paper for C2+TC2+TCC2 slot
Class Number(s) : Common to all faculties handling C2+TC2+TCC2 slot
Date of Examination : 18-03-2025
Exam Duration : 90 minutes

Maximum Marks: 50

General instruction(s): Answer All Questions

| Q. No | Question | Marks | Course Outcome (CO) | Bloom's Taxonomy (BL) |
|-------|--|-------|---------------------|-----------------------|
| 1. | Express the following function in terms of unit step function and hence find its Laplace transform $f(t) = \begin{cases} t^2, & 0 < t < 1 \\ 2, & 1 < t < 2 \\ e^{-t}, & t > 2 \end{cases}$ | 10 | CO2 | BL2 |
| 2. | Using partial fractions method evaluate $L^{-1}\left(\frac{s^2 + 2s + 4}{(s+5)(s^2 + 16)}\right)$. | 10 | CO2 | BL2 |
| 3. | The displacement of the mass which is suspended at one end of a spring is given by $m\frac{d^2x}{dt^2} + r\frac{dx}{dt} + cx = E(t)$ where m is mass, r is damping constant and k is spring constant. Using Laplace transform find the displacement when $m=1, r=6, c=5$ and $E(t) = 4u(t-\pi)$ with $x(0) = 0, x'(0) = 0$. | 10 | CO5 | BL3 |
| 4. | Apply Laplace transform method to solve $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial t} = \cos x$ $(x > 0, t > 0)$, with $u(x, 0) = 0, x > 0, u(0, t) = 0, t > 0$. | 10 | CO5 | BL3 |
| 5. | Obtain the Fourier series for the function $f(x) = \begin{cases} -3x, & -2 < x < 0 \\ 3x, & 0 < x < 2 \end{cases}$ | 10 | CO4 | BL2 |
