

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2022-2023

Continuous Assessment Test -II

Programme Name & Branch : B.Tech

Course Name & code : CI+TCI+TCCI

Course Name & code : Differential Equations and Transforms (BMAT102L)

Exam Duration: 90 Min.

Maximum Marks: 50

General instruction(s): Answer ALL Questions

| Q.No. | Question | Max Marks | CO | BL |
|-------|---|-----------|-----|-----|
| 1. | (a) Evaluate $\int_0^{\infty} e^{-2t} t u(t-2) dt$ (b) Find the Laplace transform of a periodic function. $f(t) = \begin{cases} 1 & \text{if } 0 < t < 1 \\ t & \text{if } 1 < t < 2 \end{cases}$ with period 2. | 5 | CO2 | BL2 |
| 2. | Find the inverse Laplace transform of $\frac{s}{s^4 + s^2 + 1}$ using Partial fractions method. | 10 | CO2 | BL3 |
| 3. | Solve the equation $L \frac{d^2 q}{dt^2} + R \frac{dq}{dt} + \frac{q}{C} = 0$, where $L=1$ henry, $R=3$ ohms, $C=0.5$ farads. Find the charge q at any time t , given that $q(0) = 0$ and $q'(0) = 3$ using Laplace transform. | 10 | CO4 | BL3 |
| 4. | Obtain the solution of $u_x + u_t + u = 0$ with $u(0, t) = 0$ ($t > 0$), $u(x, 0) = \cos x$ ($x > 0$) using Laplace transform. | 10 | CO4 | BL3 |
| 5. | Obtain the Fourier series expansion of $f(x) = \begin{cases} \frac{1}{2} + x & \text{for } -1 \leq x \leq 0 \\ \frac{1}{2} - x & \text{for } 0 \leq x \leq 1 \end{cases}$ and hence find the value of $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$ | 10 | CO3 | BL4 |