Roll No											

PRESIDENCY UNIVERSITY BENGALURU

SET B

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2024

Semester : Semester III - 2022

Course Code : MAT1002

Course Name : Transform Techniques Partial Differential Equations and Their Applications

Program : B.Tech.

Date : 03-JAN-2024
Time : 9:30AM - 12:30 PM
Max Marks : 100
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS **4 X 5M = 20M**

1. Obtain half range Fourier cosine series of x in $(0,\pi)$.

(CO1) [Knowledge]

2. Obtain Laplace transform of the function $\frac{e^{2t}-e^{3t}}{t}$.

(CO2) [Knowledge]

3. Find the Z-transform of $\sin(3n+5)$.

(CO3) [Knowledge]

4. Obtain the PDE by eliminating the arbitrary function $z=(x+y)\phi(x^2-y^2)$.

(CO4) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **5 X 10M = 50M**

5. Find Fourier series of y in $(0,6)$ up to second harmonic for the following data

x	0	1	2	3	4	5
f(x)	8	6	4	7	9	11

(CO1) [Comprehension]

6. Apply the Laplace transform technique to solve $\frac{d^2x}{dt^2}-2\frac{dx}{dt}+x=e^t$ with $x=2,\ \frac{dx}{dt}=-1$ at $t=0$.

(CO2) [Comprehension]

7. Find the Fourier transform of the function $f(x) = \begin{cases} a^2 - x^2, & |x| \le a \\ 0, & |x| > a \end{cases}$. Hence show that $\int_0^\infty \frac{\sin t - t\cos t}{t^3} dt = \frac{\pi}{4}$.

(CO2) [Comprehension]

8. Solve $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial z}{\partial x} - 4z = 0$ with $z = 1$ and $\frac{\partial z}{\partial x} = y$ when $x = 0$.

(CO4) [Comprehension]

9. Solve $(y + z)p - (z + x)q = x - y$.

(CO4) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS **2 X 15M = 30M**

10. Employ the *Z*-transform technique to find response of the system $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ with $y_0 = y_1 = 0$.

(CO3) [Application]

11. Apply the method of separation of variables to solve $3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$ where $u(x, 0) = 4e^{-x}$.

(CO4) [Application]