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**Presidency University**

**Bengaluru**

 **SCHOOL OF ENGINEERING**

**SUMMER TERM END TERM EXAMINATION – AUGUST 2024**

**Date**: 05August 2024

**Time**: 1:00PM-4:00PM

**Max Marks**: 100

**Weightage**: 50%

**Semester**: Summer Term 2024

**Course Code**: MAT 2001

**Course Name**: Transform Techniques and Partial Differential Equations

**Program & Sem.**: B. Tech. (**2020 BATCH ONLY**)

 **Instructions:**

1. *Read all the questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and Non-programmable calculators are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

**Part A**

**Answer any FOUR questions. (4Q x 5M = 20M)**

1. Find the Laplace transform of $9+t^{4}-4\cos(2t)$. (CO1) [Knowledge]

2. Find the inverse Laplace transform of $\frac{2}{s+2}+\frac{4}{s^{2}+16}$. (CO1) [Knowledge]

3. Write Fourier sine and cosine transform of $f\left(x\right)$. (CO2) [Knowledge]

4. Find the Z transform of $\left[(5)^{n}-2\left(-1\right)^{n}\right]$. (CO3) [Knowledge]

5. Form the PDE by eliminating the arbitrary function from $z=f(x+y+z)$. (CO4) [Knowledge]

**PART B**

**Answer any FIVE questions. (5Q x 10M = 50M)**

6. Express $f\left(t\right)=\left\{\begin{matrix}\sin(t), 0<t<π\\\sin(2t), π<t<2π\\\sin(3t), t\geq 2π\end{matrix}\right.$ in terms of unit step function and hence find its

 Laplace transform. (CO1) [Comprehension]

7. Use convolution theorem to find $L^{-1}\left[\frac{1}{\left(s+2\right)\left(s-1\right)}\right]$. (CO1) [Comprehension]

8. Find the Fourier sine transform of $f\left(x\right)=\left\{\begin{matrix}2x for 0<x<1\\2-x for 1<x<2\\0 for x>2\end{matrix}\right.$. (CO2) [Comprehension]

9. Form the PDE by eliminating the arbitrary functions from $z=yf\left(x\right)+xg(y)$.

 (CO4) [Comprehension]

10. Solve $\frac{∂^{2}z}{∂x^{2}}+z=0$, given that when $x=0, z=e^{y} and\frac{∂z}{∂x}=1$. (CO4) [Comprehension]

11. Solve $xp-yq=y^{2}-x^{2}.$ (CO4) [Comprehension]

**Part C**

**Answer any TWO questions. (2Q x 15M = 30M)**

12. Apply Laplace transform technique to solve $y^{''}\left(t\right)+4y^{'}\left(t\right)+3y(t)=e^{-t} $ with

 $y\left(0\right)=0=y^{'}\left(0\right)$. (CO1) [Application]

13. Apply Z transform method to solve $y\_{n+2}+2y\_{n+1}+y\_{n}=0$ with $y\_{0}=0,y\_{1}=1$. (CO3) [Application]

14. Obtain a solution of the equation $3\frac{∂u}{∂x}-2\frac{∂u}{∂y}=0$ where $u\left(x,0\right)=9e^{-2x}$ by method of

 separation of variables. (CO4) [Application]