PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

Course Code: MAT2001   **MAKEUP EXAMINATION- JAN 2023**

Course Name: Transform Techniques and Partial differential Equations

Program : B.Tech – All Programs

Date: 20-JAN-2023

Time:01.00 PM-04.00 PM

Max Marks: 100

Weightage: 50%

Instructions:
(i)   Read the question properly and answer accordingly.
(ii)   Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted

Part A [Memory Recall Questions]

Answer all the Questions. Each Question carries Five marks.   **(4Qx 5M= 20M)**

1. Find the Laplace transform of $\cos(at+b)$

(CO.No1.)[Comprehension level]

2. Find the Fourier Sine transform of $f(x) = \begin{cases} x & 0 < x < 2 \\ 0 & elsewhere \end{cases}$

(C.O.No 2.) [Comprehension level]

3. *(i) Find* the Z - transform of $3n - 4\sin\left(\dfrac{n\pi}{4}\right) + 5a$

   (ii) Find the inverse Z - transform of $\dfrac{5Z}{(2-Z)\ (3Z-1)}$

(C.O.No 3.) [Comprehension level]

4. Form the PDE by eliminating the arbitrary functions from $z = f_1(y + 2x) + f_2(y - 3x).$

(C.O.No 4.) [Comprehension level]

Part B [Thought Provoking Questions]

Answer all the Questions. Each Question carries TEN marks.   **(5Qx10M=50M)**

5. . Express $f(t) = \begin{cases} t - 1 & for \ 1 < t < 2 \\ 3 - t & for \ 2 < t < 3 \end{cases}$ in terms of unit step function and hence find its

   Laplace transform.   (C.O. No. 1) [Comprehension]

6. Evaluate $L^{-1}\left[\dfrac{1}{s(s^2+4)}\right]$ using convolution theorem.   (C.O. No. 1) [Comprehension]

7. Find the Fourier transform of $f(x) = \begin{cases} 1 & |x| < 1 \\ 0 & |x| > 1 \end{cases}$, hence evaluate $\displaystyle\int_0^\infty \frac{\sin x}{x} \, dx.$

                                                            (C.O.NO 2) [Comprehension level]

8. Solve $\dfrac{d^2 z}{dx^2} + 4z = 0$, given that when $x = 0, z = e^{2y}$ and $\dfrac{\partial z}{\partial x} = 2.$

                                                            (C.O. No. 4) [Comprehension]

9. Solve $xp + yq = 3z.$ (C.O. No. 4) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. Each Question carries FIFTEEN marks.   **(2Qx15M=30M)**

10. Apply Laplace transform technique to solve $\dfrac{d^2 y}{dt^2} - y = t$ with $y(0) = 0$ & $y'(0) = 0.$
                                                            (C.O. No. 1) [Application]

11. Using Z-Transform solve the difference equation. $u_{n+2} + 4u_{n+1} + 3u_n = 3^n$ with $u_0 = 0$ and $u_1 = 1.$

                                                            (C.O. No. 3) [Application]