



# PRESIDENCY UNIVERSITY BENGALURU RESEARCH & DEVELOPMENT

#### Ph.D. Course Work - Mid Term Examination - SEPTEMBER 2024

School/Department: Engineering/ Mathematics Date: 28/09/2024

Course Code: MAT 842 Time: 2:00PM-3:30PM

Course Name: Transform Techniques for Signal Analysis Max Marks: 50

Course Credit: 3-0-0 Weightage: 25%

## **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 2 marks. (5Qx2M=10M)

- 1. Define the Fourier Series and write Dirichlet's conditions. (C.O.NO.1) [Knowledge]
- 2. What are Euler Coefficients? (C.O.NO.1) [Knowledge]
- 3. Find Laplace Transform of  $L\{t^2 3t + 5\}$  (C.O.NO.1) [Knowledge]
- 4. What is the difference between Z-transform and Laplace transform? (C.O.NO.2) [Knowledge]
- 5. Define Wavelets transform. Mention it's real-world applications. (C.O.NO.2) [Knowledge]

#### Part B [Thought Provoking Questions]

#### Answer all the Questions. Each question carries 4 marks. (4Qx4M=16M)

6. a. Find the Fourier cosine transform of

$$f(x) = \begin{cases} x & 0 < x < 1 \\ 2 - x & 1 < x < 2 \\ 0 & x > 2 \end{cases}$$

b. Find the Fourier transform of  $(x) = \begin{cases} 1 & |x| < a \\ 0 & |x| > a \end{cases}$ 

(C.O.NO. 1) [Comprehension]

7. Explain briefly the importance of wavelet analysis. (C.O.NO. 1) [Comprehension]

b. 
$$L^{-1}\left\{\frac{s+2}{s^2-4s+13}\right\}$$

c. 
$$L^{-1}\left\{\frac{3+4s}{9s^2-16}\right\}$$

8 Find a.  $L^{-1}\left\{\frac{s}{(s+4)^2}\right\}$  b.  $L^{-1}\left\{\frac{s+2}{s^2-4s+13}\right\}$  c.  $L^{-1}\left\{\frac{3+4s}{9s^2-16}\right\}$  (C.O.NO. 1) [Comprehension]

9. Find the Z transform of  $x(n) = \{1,2,3,2\}$  and R.O.C of the signal (C.O.NO. 2) [Comprehension]

### **Part C [Problem Solving Questions]**

Answer all the Questions. Each question carries 8 marks. (3Qx8M=24M)

- 10. a) State the conditions for a signal to be admitted as a mother wavelet -02 M
- b) Discuss briefly various forms of wavelet transforms 06 M (C.O.NO. 2) [Application]
- 11. Describe the working of Discrete wavelet transforms in signal and image processing (C.O.NO. 2) [Application]
- 12. Explain the advantages of wavelet transforms over other existing integral transforms. (C.O.NO. 2) [Application]