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Roll No:

(To be filled in by the candidate)

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

SEMESTER EXAMINATIONS, SEPTEMBER / OCTOBER 2019

MSc - SOFTWARE SYSTEMS Semester: 3

15XW33 TRANSFORM TECHNIQUES

Time: 3 Hours Maximum Marks: 100

INSTRUCTIONS:

- 1. Answer **ALL** questions. Each question carries 20 Marks.
- 2. Subdivision (a) carries 3 marks each, subdivision (b) carries 7 marks each and subdivision (c) carries 10 marks each.
- 1. a) Does the Laplace Transform of $f(t) = \frac{1}{t}$ exists? Justify your answer.
 - b) (i) State t -shifting theorem in Laplace Transforms. Why it is called t-shifting? (3)
 - (ii) What do you mean by unit step function and unit impulse function? Give real time examples for each. (4)
 - c) Solve the initial value problem y'' + y' 2y = t given that y(0) = 0, y'(0) = 6 using Laplace Transform.
- 2. a) Without using actual integration evaluate $\int_0^\infty e^{-5t} \cos 2t \ dt$.
 - b) (i) Give the geometrical and physical meaning of convolution of two functions. (3)
 - (ii) Find the Inverse Laplace Transform of $\ln\left(\frac{s^2+a^2}{s^2}\right)$. (4)
 - c) (i) Find the Laplace Transform of the triangular wave $f(t) = \begin{cases} t & \text{if } 0 \le t \le a \\ 2a t & \text{if } a \le t \le 2a \end{cases}$ it is given that f(t + 2a) = f(t).

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- (ii) State and prove the convolution theorem and use it to find the Inverse Laplace transform of $\frac{s^2}{(s^2+25)(s^2+16)}$.
- 3. a) State the existence conditions for Fourier Transform.
 - b) Find the Fourier Transform of e^{-ax^2} , a>0. Hence prove that $e^{-\frac{x^2}{2}}$ is self reciprocal under Fourier Transform.
 - c) (i) Find the Fourier Sine and Cosine Transform of e^{-ax} . Hence find the Fourier Sine and Cosine Transform of xe^{-ax} , find the Cosine Transform of $e^{-|x|}$ and evaluate the integrals $\int_0^\infty \frac{dx}{(a^2+x^2)^2}$, $\int_0^\infty \frac{x^2}{(a^2+x^2)^2} dx$.

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(ii) Find the Inverse Fourier Transform of $F(s) = \begin{cases} a - |s| & \text{for } |s| < a \\ 0 & \text{otherwise} \end{cases}$. Hence show that $\int_0^\infty \left(\frac{\sin x}{x}\right)^2 dx = \frac{\pi}{2}$.

- 4. a) Illustrate the computational efficiency of Fast Fourier transform with an example.
- $x(n) = \{1,2,3,4,4,3,2,1\} \quad \text{using DIT-FFT}$ ence wavelet trace: b) What do you mean by periodic sequences? Find the circular convolution of the periodic sequences $\{1, -1, 1, 3\}$ and $\{7, 2, 0, 1\}$.
 - c) Find the Discrete Fourier Transform of algorithm.
- a) State the admissibility condition for the existence wavelet transform.
 - b) (i) What do you mean by detail signal? What is the use of the detail signal? (3)
 - (ii) Explain the discritization process and the steps involved in the fast algorithm for the computation of Discrete Wavelet Transform.
- State the construction principle for wavelet. Construct the following wavelet with PSGTECH PSGTEC example: Haar wavelet, Mexican-hat-Wavelet and Morlet wavelet. Also give the existence conditions for the above. PSGTECH PSGTECH PSGTECH PSGTECH PSGTECH PSGTECH

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