No of Pages : 2 **Course Code : 18XW33**

Roll No:
(To be filled in by the candidate)

PSGCOLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

SEMESTER EXAMINATIONS, NOVEMEBR 2019

MSc - SOFTWARE SYSTEMS Semester: 3

18XW33 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.
3. Course Outcome : Table

Qn.1	CO.1	Qn.2	CO.2	Qn.3	CO.3	Qn.4	CO.4	Qn.5	CO.5

1. a) Give the geometrical interpretation for unit impulse function. Also mention a real-time scenario for the same.

   b) i) Express the function represented by the graph in Fig.1 in terms of unit step function and then find its Laplace transform.

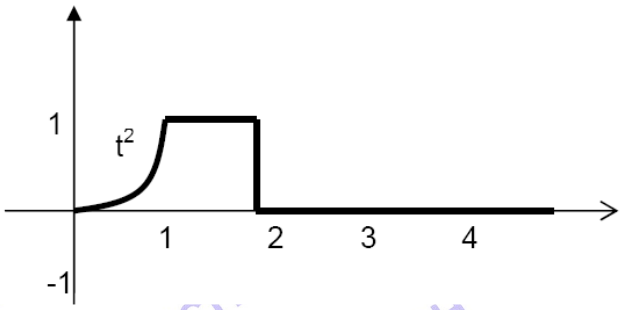

Fig.1

   ii) The current $i(t)$ in a simple $RL-$circuit is modeled by the ordinary differential equation $\frac{di}{dt}+10i=\begin{cases}2 & if\ 0\le t<5\\ 0 & if\quad t\ge 5\end{cases}$ together with the initial condition $i(0)=0$. Find the current at any time $t>0$.

   c) Determine the response of damped mass spring system modeled by the differential equation with usual notations:
   $y''+5y'+6y=u(t-1)+\delta(t-2),\ y(0)=0, y'(0)=1$

2. a) Does the Fourier Transform of unit step function exist? If so, find it. If not, why?

   b) i) Find the Fourier transform of $f(t)=\begin{cases}0, & t<a\\ 1, & a<t<b\\ 0, & t<b\end{cases}$ (3)

   ii) Show that $f(x)=e^{-x^2/2}$ is self-reciprocal with respect to Fourier transform.(4)

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c) Find the Fourier transform of $f(t)=\begin{cases}1-|t| & if\ |t|<1\\ 0 & if\ |t|>1\end{cases}$.

Hence deduce that $\int_0^{\infty}\left(\frac{\sin t}{t}\right)^2 dt=\frac{\pi}{2}$ and $\int_0^{\infty}\left(\frac{\sin t}{t}\right)^4 dt=\frac{\pi}{3}$.

3. a) Show the computational efficiency of Fast Fourier Transform with an example.

b) i) Find the Inverse Discrete Fourier Transform (IDFT) of $X(k)=\{0,3-3i,2,3+3i\}$ by using DIT-FFT algorithm. (3)

ii) Convolve the sequences $x(n)=\{1,-2,3,-4,4,-3,2,-1,5,-5\}$ and $y(n)=\{3,2,1,-1\}$ by overlap-add method. (4)

c) Find the Discrete Fourier Transform (DFT) of $x(n)=\{1,2,1,3,1,4,1,5\}$ by using the decimation in time radix-2 Fast Fourier Transform algorithm.

4. a) Comment on the statement "The Z-transform is the discrete-time counterpart of the Laplace transform and generalization of the Fourier Transform of a sample signal".

b) i) Given that you can take one step or two steps forward from a given step. Write a recurrence relation to express the total number of ways of reaching Nth step. (3)

ii) Find the region of convergence (ROC) in Z-transform for the signal in Fig.2 (4)

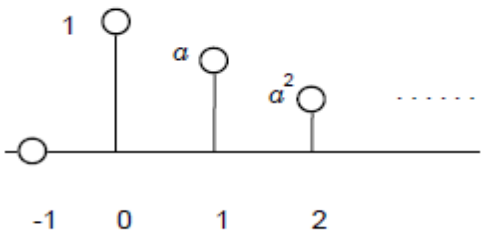

Fig.2

c) Using Z-transform solve $y_{n+2}-5y_{n+1}+6y_n=4^n$ given that $y_0=0, y_1=1$.

5. a) What do you mean by a wavelet? How wavelet is useful in image processing?

b) i) What is Short Time Fourier Transform (STFT)? Why do we go for continuous wavelet transform (CWT)? (3)

ii) Distinguish between Fourier transform and CWT. (4)

c) State the construction principle for wavelet. Construct the following wavelets by taking an example for each: Haar wavelet, Mexican-hat-Wavelet and Morlet wavelet. Also specify the existence conditions for the above.

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