Regulation R18 ***Subject code:*** 2P3DD

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech III Semester Regular/Supplementary Examinations, February 2021

SIGNALS AND SYSTEMS

(Electronics and Communication Engineering)

Maximum Marks: 70 Date: 24.02.2021 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks **(10x2M=20 Marks)**

1 Write orthogonality condition in complex functions
2 State parseval's theorem for continuous time periodic signals.
3 Develop the synthesis and analysis equation of continuous time Fourier Transform
4 Define Nyquist rate and Nyquist interval.
5 Write the conditions for a system to be LTI System.
6 Write paley-wiener criteria for causality.
7 Deduce the impulse response of two LTI systems when connected in parallel.
8 Combine the following signals using Convolution u(t-1) and δ(t-1).
9 Solve the impulse response of the system given by
H(s) =1/(s+9).
10 Estimate the initial and final values of the function
$X(z) = (1+z^{-1}) / (1-0.25z^{-2})$

Part-B

Answer All the following questions. **(10M X 5=50Marks)**

11 (i)Find the expression for mean square error using the expression of a function using orthogonal signal space. [6+4]M
(ii)Define and sketch the following elementary signals
a) unit impulse signal b) unit step signal

OR

12 Express the exponential Fourier series for the signal $f(t) = e^{-t}$,$0 \leq t \leq 0.5$ and also plot the magnitude and phase spectrum [7+3]M
(ii)Identify the Fourier Series coefficients of the signal
$x(t) = 1 + \sin 2\omega t + 2\cos 2\omega t + \cos(3\omega t + \pi/4)$

13 Predict the fourier transform of x(t) =e^(jat^2)and hence find the fourier transform of the functions cos(at^2),sin(at^2). [10]M

OR

14 (i)Explain the concept of sampling theorem with necessary equations. [6+4]M

(ii) Consider an analog signal x(t) = 5cos200πt.

(a) Examine the minimum sampling rate to avoid sampling.
(b) If sampling rate F_s =400Hz.What is the Discrete time signal after sampling?

15 Explain and derive the relationship between rise time and bandwidth for Low pass system. [10]M

OR

16 Formulate the properties linearity, causality, time invariance and dynamicity of the given systems. [4+3+3] M
(i) $d^2y(t)/dt^2+3tdy(t)/dt+y(t)=x(t)$
(ii) $y(n)=x(n^2)+x(n)$
(iii) $y(n)=\log x(n)$

17 (i)Examine the convolution y(t) of the given signal [5+5]M
x(t)=u(t), h(t)= $RLe^{-t(R/L)}u(t)$
(ii)Obtain the output y[t] for the LTI system whose response h[t] = u(t-3) and input x[t]= u(t+1)

OR

18 State & prove Auto-correlation properties. [10]M

19 (i) The system transfer function is given as [5+5]M
$H(s)= s/(s^2+5s+6)$. The input to the system is $x(t)=e^{-t}u(t)$. Develop the output assuming zero initial conditions.

(ii) Estimate the system function for the system with output response $y(t) =2e^{-3t}u(t)$ and input x(t) =u(t).

OR

20 Examine the impulse response of a discrete time LTI system [2+3+5] M
$h(n) = [-2(1/3)^n + 3(1/2)^n] u(n)$.
(i) Find the system Function H(z) of the system.
(ii) Find the difference equation representation of the system
(iii) Find the step response of the system