



Regulation R18

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY  
(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code: 2P3DD

**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  $\delta(t-1)$ .
- 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 [6+4]M using orthogonal signal space.  
(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 [7+3]M  
 $f(t) = e^{-t}, 0 \leq t \leq 0.5$  and also plot the magnitude and phase spectrum  
(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 [10]M  
transform of the functions  $\cos(at^2), \sin(at^2)$ .  
OR
- 14 (i) Explain the concept of sampling theorem with necessary equations. [6+4]M  
(ii) Consider an analog signal  $x(t) = 5\cos 200\pi t$ .

- (a) Examine the minimum sampling rate to avoid sampling.  
 (b) If sampling rate  $F_s = 400\text{Hz}$ . 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

$x(t) = u(t)$ ,  $h(t) = RL e^{-t(R/L)} u(t)$

(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