PVP 20

Code: 20EC3303, 20EE3302

II B.Tech - I Semester – Regular Examinations - FEBRUARY 2022

SIGNALS AND SYSTEMS
(Common for ECE, EEE)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

UNIT – I

1. a) Define and sketch the following signals both in continuous and discrete time domains. 6 M
   i) Impulse function ii) Unit Step Signal
   ii) Ramp Signal.
   b) Determine whether the following systems are Linear, Time Invariant, Causal and Static or not? 8 M
   i) $y(t) = x^2(t)$ ii) $y(n) = n\,x(n)$.

OR

2. a) Sketch the signals i) $y_1(t) = u(t-3)$ 8 M
   ii) $y_2(t) = u(t+3)$ iii) $y_3(t) = u(-t-3)$ and
   iv) $y_4(t) = u(-t+3)$.
   b) Find the even and odd parts of 6 M
   i) $x(t) = e^{5t}$ ii) $x(t) = 5+3t+4t^2$.

UNIT – II

3. a) Determine whether the given systems are Stable or Unstable and Static or Dynamic? 5 M
   i) $h(n) = (1/3)^n u(n)$ ii) $h(n) = n\,u(n)$.

b) State and Prove the Commutative, Distributive and Associative properties of Continuous Time LTI system. 9 M

OR

4. a) Perform the convolution of the signals 8 M
   i) x(t) = 5 u(t) and h(t) = 3 u(t)
   ii) x(t) = e^{-5t}u(t) and h(t) = e^{-2t}u(t)

   b) Find out the Convolution of x(n) = {2,-1,3,2}and h(n) = {1,-1,1,1} using graphical method. 6 M

UNIT-III

5. a) Derive the expression for Trigonometric Fourier series coefficients. 8 M

   b) Find out the exponential Fourier Series for 6 M
   x(t) = 0 for -2< t< -1
   = A for -1< t < 1
   = 0 for 1< t < 2
   with fundamental period T=4 sec.

OR

6. a) Find out the Fourier Transform of 6 M
   x(t) = e^{-at} cos $\omega_0 t$ u(t)

   b) State and Prove any 4 properties of Fourier Transform. 8 M

UNIT – IV

7. a) State and prove time shifting and convolution properties of DTFT. 7 M

   b) Find the response of an LTI for input x(n) = {1,2,3,1} if h(n) = {1,2,1,-1} 7 M

OR

8. a) Determine Fourier Transform and plot Magnitude and Phase spectrum of x(n) = 1/3 ; $0 \leq n \leq 2$. = 0; elsewhere. 7 M

b) Find x(n), if $X(e^{j\omega}) = \frac{1}{(1-0.5e^{-j\omega})(1-0.2e^{-j\omega})}$ 7 M

UNIT – V

9. a) State and Prove i) Linearity ii) Differentiation in Time iii) Time Scaling and iv) Convolution in Time Properties of Laplace Transform. 8 M

b) Determine the Laplace Transform of 6 M

x(t) = 2t/T; $0 \leq t \leq T/2$

= $(2 - 2t)/T$; $T/2 \leq t \leq T$.

OR

10. a) Determine Z Transform of $x(n) = a^n \sin(\omega_0 n)u(n)$. 7 M

b) Determine Inverse Z Transform of 7 M

$X(Z) = \frac{z(z^2-4z+5)}{(z-1)(z-2)(z-3)}$ for ROC $|z| < 1$.