PVP 19

Code: 19EC3303, 19EE3303

II B.Tech - I Semester – Regular Examinations – MARCH 2021

SIGNALS AND SYSTEMS

(Common for ECE & EEE)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.
4. All parts of Question paper must be answered in one place

PART – A

1. a) Calculate the even and odd components of the following signal $x(t) = \cos t + \sin t + \cos t \sin t$

b) Calculate the energy of the following signal

$$x(t) = 10 \cos 5t \cos 10t$$

c) Define Region of Convergence. Also state any two properties of Region of convergence with respect to Laplace Transform.

d) Compute the DTFT of x[n] = $(1/4)^n$u[n]

e) What are Dirchlet's conditions? State them with respect to Fourier Transform.

PART – B

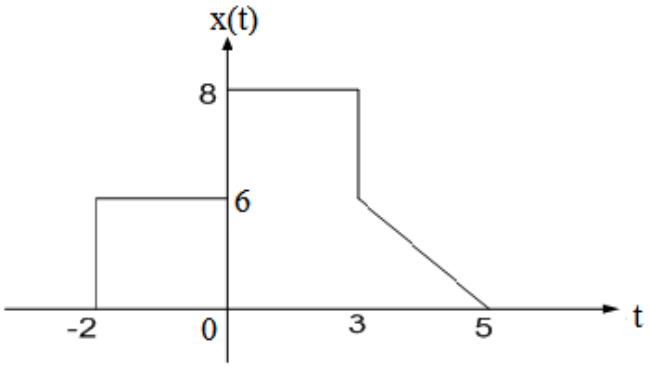
UNIT – I

2. a) Find whether the following signals are periodic or not. 6 M
If a signal is periodic, determine its fundamental period

i) $x[n] = \sin 2\pi n + \sin 6\pi n$

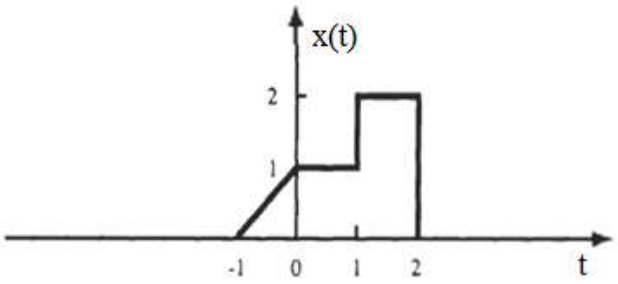
ii) $x[n] = e^{j\frac{\pi}{4}n}$

b) Calculate the even and odd components of the signal x(t) — 6 M



OR

3. a) A continuous-time signal x(t) is shown in Fig. Sketch and label each of the following signals. — 8 M
   i) -2x(2t-3)
   ii) 3x(-3t +2)



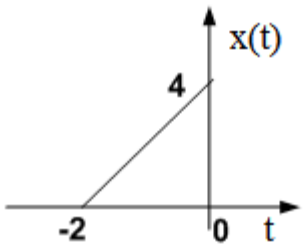
b) Check the Linearity, Static/Dynamic nature, Time variance/invariance, Causality of the system defined by differential equation — 4 M

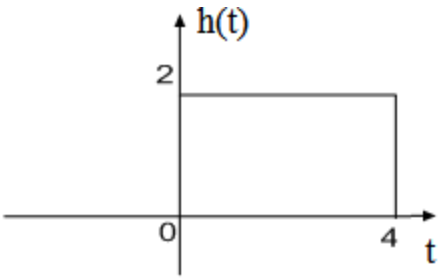
$$\frac{d^3}{dt^3}y(t) + 2\frac{d^2}{dt^2}y(t) + 4\frac{d}{dt}y(t) + 3y^2(t) = x(t+1)$$

UNIT – II

4. a) An LTI system is characterized by $h(n)=(3/4)^n u(n)$. Compute the output of the system at time n = 5, -5, 10 when input x(n) = u(n). — 6 M

b) Evaluate the graphical convolution of two signals $x(t)$ and $h(t)$ given below — 6 M





OR

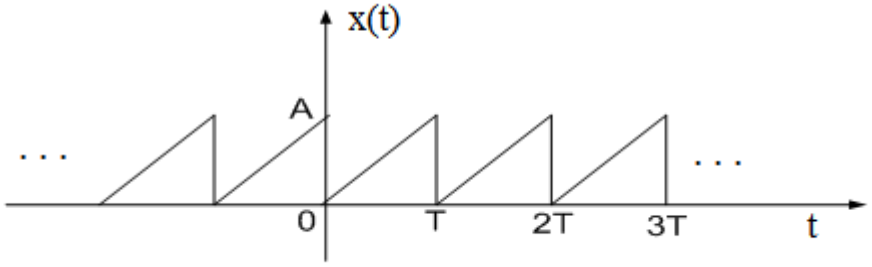
5. a) List and state the properties of Convolution Integral. 6 M

b) Two LTI systems that are cascaded have impulse responses $h_1[n] = [4, 2, 1, 3]$ and $h_2[n] = [1, 2, 2, 1]$. Calculate the impulse response of the overall system. 6 M

UNIT-III

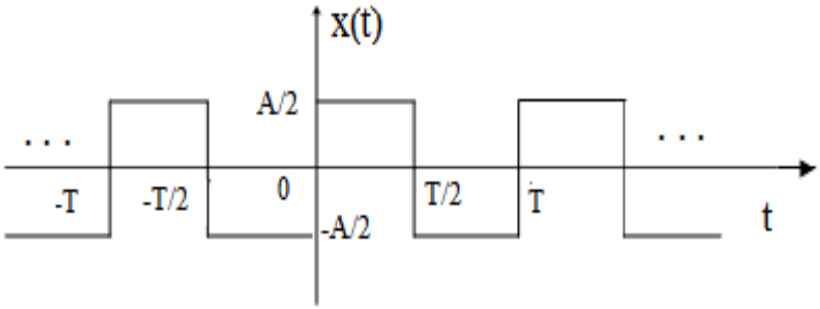
6. a) Find the Fourier transform of a train of impulses of unit height separated by T sec. 6 M

b) Evaluate the exponential Fourier Series of the following signal and also draw magnitude and Phase spectrum. 6 M



OR

7. Evaluate the exponential Fourier Series of the following signal and also draw magnitude and Phase spectrum. 12 M



UNIT – IV

8. a) Sketch the magnitude and Phase response of the system with difference equation 6 M
   $y(n) = 0.5x(n) + 0.5x(n-1)$
   b) State and prove the following properties of DTFT: 6 M
      i) Time Convolution
      ii) Parseval's Relation

OR

9. a) Determine the impulse response of the system described by the difference equation 6 M
   $y(n) = 0.7y(n-1) - 0.1y(n-2) + 2x(n) - x(n-2)$
   b) Find the DTFT of the following discrete time sequences: 6 M
      i) $x(n) = \{1, -2, 2, 3\}$
      ii) $x(n) = \delta(n+3) - \delta(n-3)$

UNIT – V

10. a) Calculate all possible ROC conditions of Inverse Laplace Transforms of 6 M

$$X(S) = \frac{S^2 + 2S + 5}{(S+3)(S+5)^2}$$

   b) Determine the Z-Transform and ROC of following sequence: 6 M

$$x(n) = a^n u(n) - b^n u(-n-1)$$

OR

11. a) Find the inverse Z-Transform of 6 M

$$X(z) = \frac{z}{(z-1)(z-2)^2} \qquad |z| < 2$$

   using partial fraction expansion.
   b) State and prove the time convolution property of Laplace Transform. 6 M