Code No.: EC303PC

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CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Supply)- June- 2022
SIGNALS AND SYSTEMS
(ECE)

[Time: 3 Hours]   [Max. Marks: 70]

Note: 1. Answer *any FIVE questions. Each question carries 14 marks.*
  2. *All questions carry equal marks.*
  3. *Illustrate your answers with NEAT sketches wherever necessary.*

                                                                  5X14=70

1. a) Perform the following operations on the given continuous time signal as shown in   [7M]
        figure (a).

        (i) $x(t-1)$

        (ii) $x(4-3t)$

        (iii) $x(2t+1)$

        (iv) $\left[x(t)+x(-t)\right]u(t)$

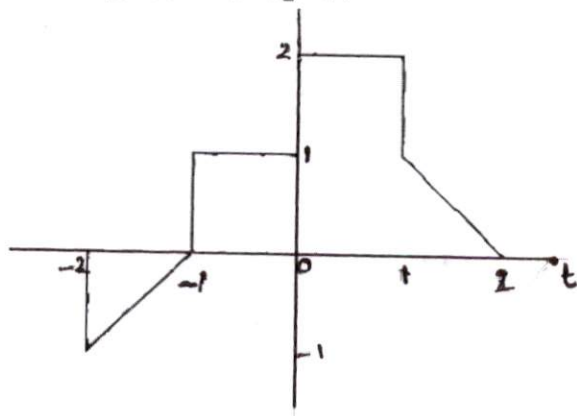Fig. a

  b) Determine and sketch even and odd components of the following discrete time   [7M]
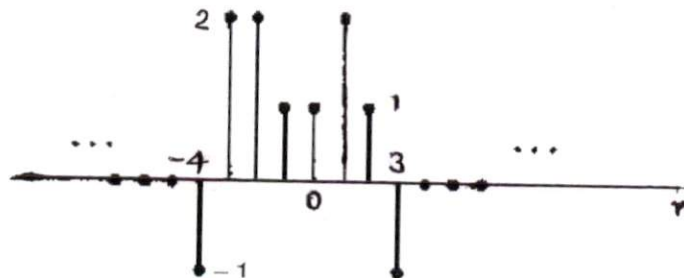   sequences as shown in figure (b).

Fig. b.

2. a) Obtain the exponential Fourier series coefficients of the following periodic signal as shown in figure (c). [7M]
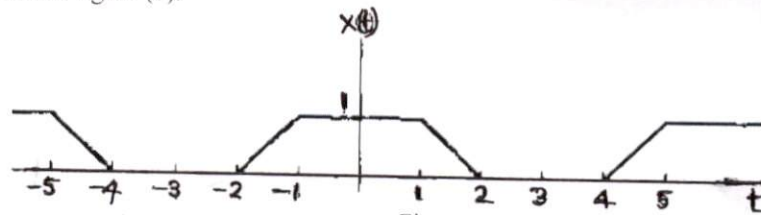

Fig.c.

b) Give the Dirichlet's condition for existence of Fourier series. Draw the magnitude and phase spectrum of the below figure (d). [7M]
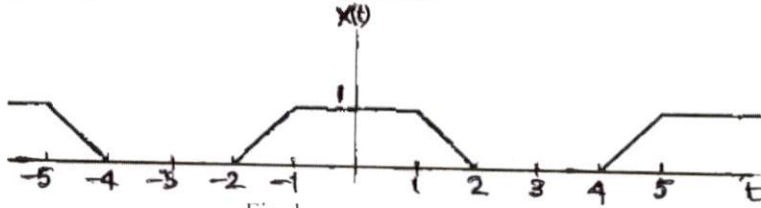

Fig.d

3. a) Check the linearity, time invariance, causality of the following systems. [7M]
(i) $y(t) = a x(t) + b$ (ii) $y(t) = t x(t)$ (iii) $y(t) = x(-t)$ (iv)
$y(t) = Re\{x(t)\}$

b) Give the relation between rise time and bandwidth with proper derivation. [7M]

4. a) Find the Laplace transform of the following signals and sketch ROC of the following signals. [7M]

(i) $x_1(t) = -e^{-7t} u(-t) + e^{-8t} u(t)$

(ii) $x_2(t) = -e^{4t} u(-t) - e^{7t} u(-t)$

b) Prove any two properties of z-transform. [7M]

5. a) Give the differences between natural and flat-top sampling with necessary waveforms. Explain aliasing condition. [7M]

b) Perform the convolution and correlation of the following two signals. Comment on the results. [7M]

$$x_1(n) = \{1, 2, 3, 4\} \quad x_2(n) = \{1, 1, 1, 1\}$$

6. a) Find whether the following signals are energy or power or neither. [7M]
(i) $x(t) = e^{-9t} u(t)$ (ii) $x(t) = 3 \cos(2000 \pi t)$

b) Show that the following set of signals form a mutually orthogonal set. [7M]
$\{1, \cos(\omega_o t), \cos(2\omega_o t), \ldots\ldots\ldots\ldots\cos(n\omega_o t)\}$

$$\omega_o = \frac{2\pi}{T}$$

7. a) Evaluate the Fourier transform of the following signals. [7M]

(i) $x(t) = e^{-at} u(t) \cos(\omega_o t)$ (ii) $x(t) = \frac{sin(\pi t)}{\pi t}$

b) State and prove the time convolution property of Fourier transform. [7M]

8. a) Obtain the convolution of the following two signals using graphical method. [7M]
$x_1(t) = e^{-at} u(t) \quad x_2(t) = u(t)$

b) What is an LTI system? Explain its properties. Derive an expression for the transfer function of an LTI system [7M]

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