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Fourth Semester B.E. Degree Examination, June/July 2019 Signals and Systems

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Find the odd part and even part of the signal given in Fig.Q1(a). (08 Marks)

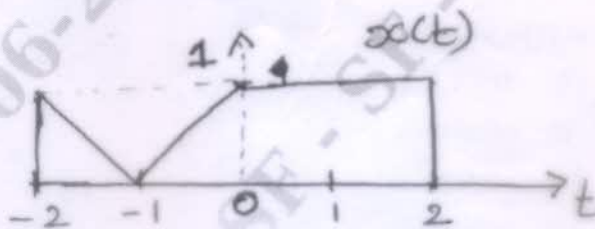


Fig.Q1(a)

- b. Find $4x(-3n + 4)$, if $x(n)$ is as shown in Fig.Q1(b). (04 Marks)

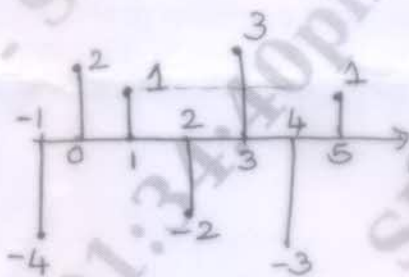


Fig.Q1(b)

- c. Find whether the signal is causal, linear, time variant and static for all values of 'n'.
 $y(n) = x(-3n)$. (04 Marks)

OR

- 2 a. Find whether the given signal is periodic and if periodic, determine the period:
 $x(t) = a \cos(\sqrt{2}t) + b \sin\left(\frac{t}{4}\right)$. (04 Marks)
- b. Sketch the following signal $x(t) = r(t+1) - r(t-1) + 2r(-3)$. (05 Marks)
- c. Find $y(-t-2) \cdot x\left(\frac{t}{2} + 1\right)$ if $y(t)$ and $x(t)$ are as shown in Fig.Q2(c). (07 Marks)

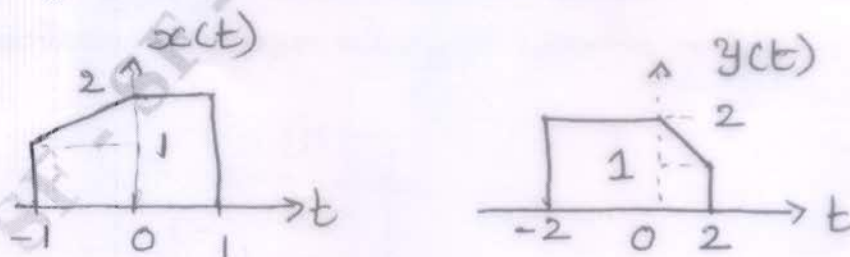


Fig.Q2(c)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-2

- 3 a. Make use of graphical method to perform the convolution of two signals $x_1(n)$ and $x_2(n)$

$$x_1(n) = \left\{ 1, \underset{\uparrow}{2}, 3, 4 \right\}$$

given :

$$x_2(n) = \left\{ -2, \underset{\uparrow}{0}, 2 \right\}$$

(08 Marks)

- b. Find $x_1(t) * x_2(t)$ if

$$x_1(t) \begin{cases} e^{-t}; & 0 \leq t \leq 1 \\ 0; & \text{otherwise} \end{cases}$$

$$x_2(t) \begin{cases} 2; & 0 \leq t \leq 2 \\ 0; & \text{otherwise} \end{cases}$$

(08 Marks)

OR

- 4 a. Find $x_1(t) * x_2(t)$ if

$$x_1(t) \begin{cases} 1; & 0 \leq t \leq 2 \\ 0; & \text{otherwise} \end{cases}$$

$$x_2(t) \begin{cases} t; & 0 \leq t \leq 1 \\ 0; & \text{otherwise} \end{cases}$$

(08 Marks)

- b. Find the convolution of $x_1(n)$ and $x_2(n)$ if $x_1(n) = a^n u(n)$ $x_2(n) = b^n u(-n)$.

(08 Marks)

Module-3

- 5 a. Define the following properties of DTFS :

i) Convolution ii) Periodicity iii) Linearity

(06 Marks)

- b. Find the complex exponential Fourier series for the periodic rectangular pulse train shown in Fig.Q5(b).

(10 Marks)

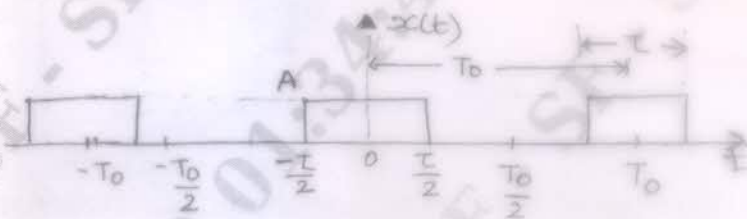


Fig.Q5(b)

OR

- 6 a. Find the DTFS coefficients of the signal shown in Fig.Q6(a).

(10 Marks)

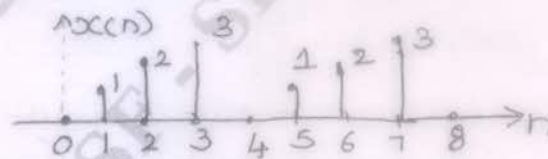


Fig.Q6(a)

- b. Find an expression for impulse response of interconnection of LTI systems shown in Fig. Q6(b).

(06 Marks)

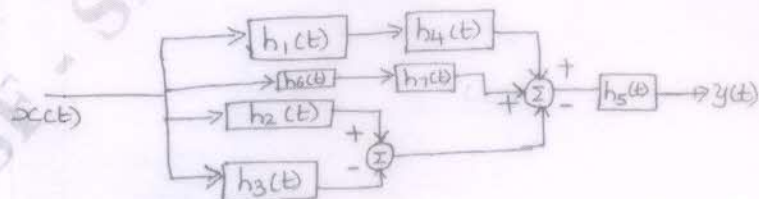


Fig.Q6(b)

Module-4

- 7 a. Construct the Fourier transform of rectangular pulse shown in Fig. 7(a). Also obtain and plot magnitude and phase responses. (08 Marks)

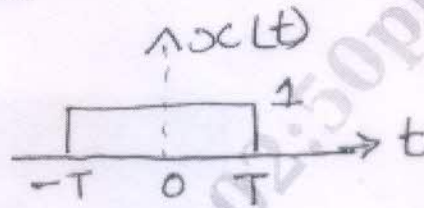


Fig. Q7(a)

- b. Define and prove the following properties of DTFT i) frequency shift ii) time reversal. (08 Marks)

OR

- 8 a. Explain sampling theorem and the concept of aliasing. (04 Marks)
 b. Find DTFT of the signal, $x(n) = -a^n u(-n-1)$. (04 Marks)
 c. Find Fourier transform of the following signals. (08 Marks)
 i) $x(t) = e^{-a|t|}$ ii) $x(t) = e^{at}u(-t)$.

Module-5

- 9 a. Explain the properties of RoC. (06 Marks)
 b. The system function of the LTI is given as $H(z) = \frac{3-4z^{-1}}{1-3.5z^{-1}+1.5z^{-2}}$. Specify the RoC of $H(z)$ and determine the unit sample response $h(n)$ for the following conditions :
 i) Stable system
 ii) Causal system
 iii) Anticausal system. Also determine poles and zeroes of $H(z)$. (10 Marks)

OR

- 10 a. Find Z-transform of $x(n) = nu(n-1)$. (06 Marks)
 b. Find inverse z-transform if $X(z) = \frac{z}{(z^2+z+0.5)(z-1)}$. (10 Marks)
