CBCS SCHEME

USN | | | | | | | | | | |

15EC44

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)**

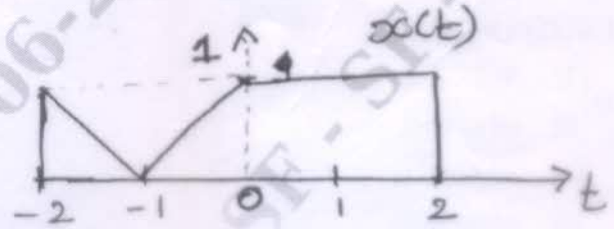

Fig.Q1(a)

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

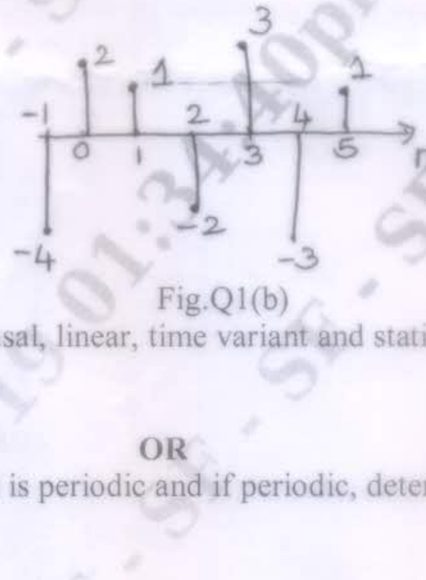

Fig.Q1(b)

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 FigQ2(c). **(07 Marks)**

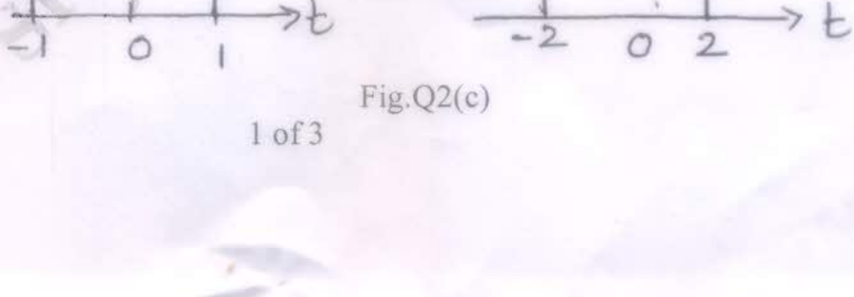

Fig.Q2(c)

Module-2

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

given : $x_1(n) = \left\{1, \underset{\uparrow}{2}, 3, 4\right\}$, $x_2(n) = \left\{-2, \underset{\uparrow}{0}, 2\right\}$. **(08 Marks)**

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

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

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

(08 Marks)

OR

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

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

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

(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)**

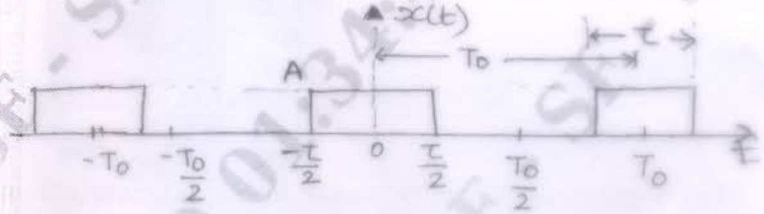

Fig.Q5(b)

OR

6 a. Find the DTFS coefficients of the signal shown in Fig.Q6(a). **(10 Marks)**

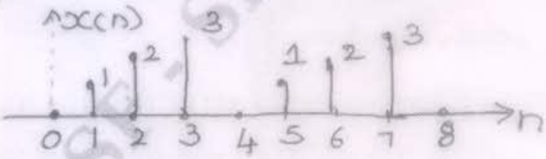

Fig.Q6(a)

b. Find an expression for impulse response of interconnection of LTI systems shown in Fig. Q6(b). **(06 Marks)**

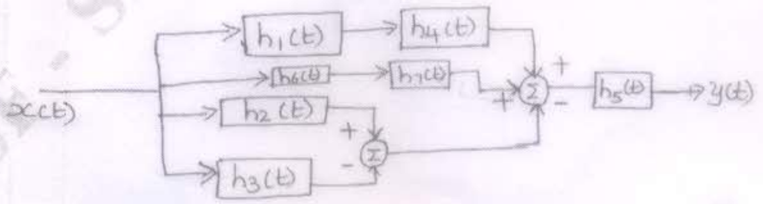

Fig.Q6(b)

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)**

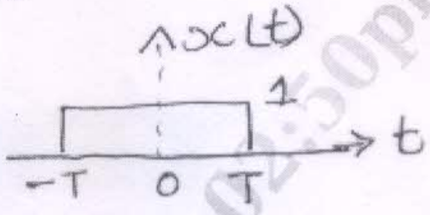

Fig.Q7(a)

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.

i) $x(t) = e^{-a|t|}$ ii) $x(t) = e^{at}u(-t)$. **(08 Marks)**

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)**

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