USN ☐☐☐☐☐☐☐☐☐☐

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)
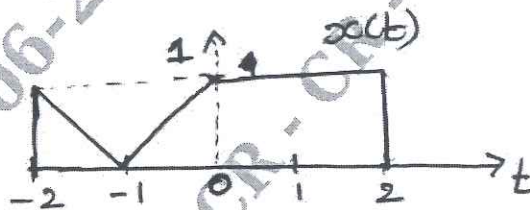

Fig.Q1(a)

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

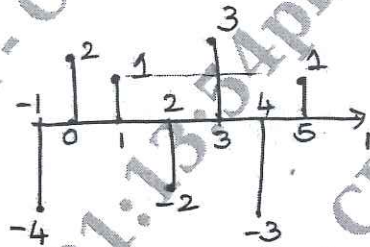Fig.Q1(b)

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 :
     $x(t) = a\cos(\sqrt{2}t) + b\sin\left(\dfrac{t}{4}\right)$.   (04 Marks)

b.   Sketch the following signal $x(t) = r(t+1) - r(t-1) + 2r(-3)$.   (05 Marks)

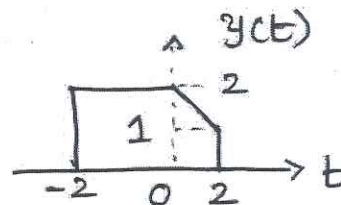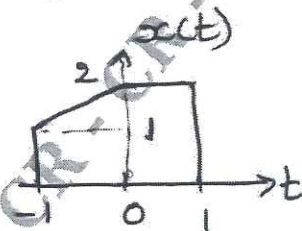c.   Find $y(-t-2) \cdot x\left(\dfrac{t}{2}+1\right)$ if $y(t)$ and $x(t)$ are as shown in FigQ2(c).   (07 Marks)

Fig.Q2(c)

1 of 3

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)

USN

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

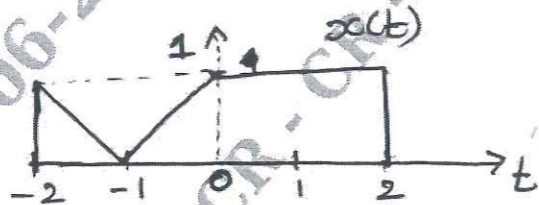**1** a. Find the odd part and even part of the signal given in Fig.Q1(a). (08 Marks)

Fig.Q1(a)

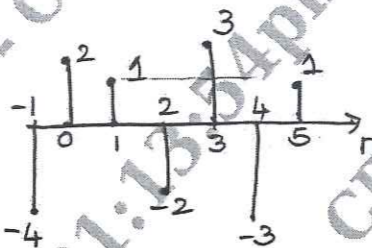b. Find $4x(-3n + 4)$, if $x(n)$ is as shown in Fig.Q1(b). (04 Marks)

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 :
$x(t) = a\cos(\sqrt{2}t) + b\sin\left(\dfrac{t}{4}\right)$. (04 Marks)

b. Sketch the following signal $x(t) = r(t+1) - r(t-1) + 2r(-3)$. (05 Marks)

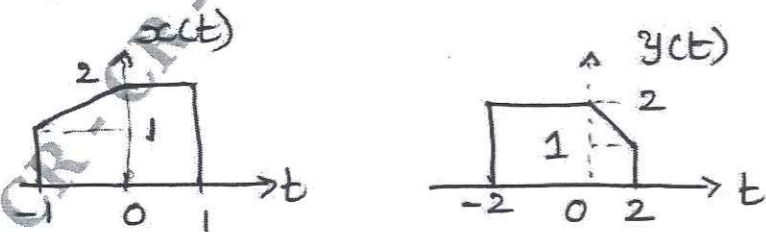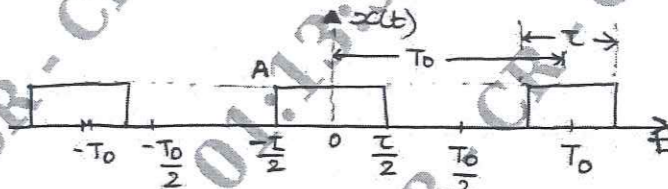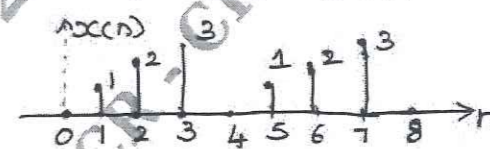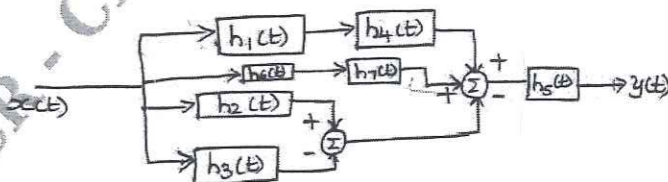c. Find $y(-t-2) \cdot x\left(\dfrac{t}{2}+1\right)$ if $y(t)$ and $x(t)$ are as shown in FigQ2(c). (07 Marks)

Fig.Q2(c)

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)**
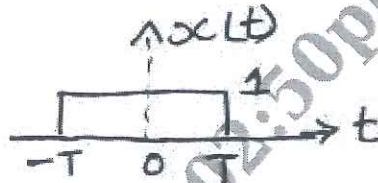

Fig.Q7(a)

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 $H(z) = \dfrac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$. 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 $X(z) = \dfrac{z}{(z^2 + z + 0.5)(z-1)}$. **(10 Marks)**

* * * * *