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Name of Examination : **Winter 2020** - (Preview)

Course Code & Course Name : **EE204U - Signals and Systems**

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Maximum Marks : **60**

Duration : **3 Hrs**

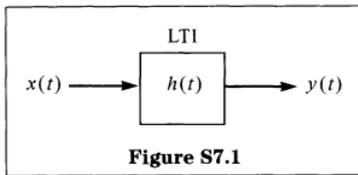
[Edit](#) [Print](#) [View Answer Key](#) [Close](#) **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

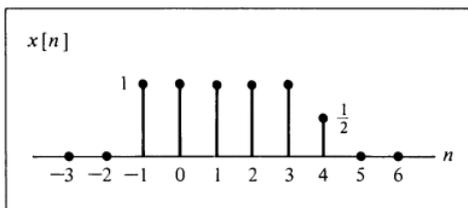
1. All questions are compulsory.
2. Illustrate your answer with suitable figures/sketches wherever necessary.
3. Assume suitable additional data; if required.
4. Use of logarithmic table, drawing instruments and non programmable calculators is allowed.
5. Figures to the right indicate full marks.

1) Attempt All Three questions

- a) List the type of signals. State and explain even and odd signal with suitable equations and waveform [6]
- b) i). For the LTI system shown in below Figure, find the output $y(t)$ where $h(t)$ is the impulse response and $x(t) = e^{j\omega t}$ is the input [3]



- ii). A discrete-time signal $x[n]$ is shown in Figure. Sketch and carefully label each of the following signals [3]
- a) $x[n - 2]$
 - b) $x[4 - n]$
 - c) $x[2n]$



- c) A discrete-time signal $x[n]$ is shown in Fig. Sketch and label each of the following signals. (i) $x[n]u[1 - n]$; [6]
- (ii) $x[n] \{u[n+2] - u[n]\}$;
- (iii) $x[2n]$

2) Solve All Three questions

- a) The output of a causal LTI system is related to the input $x(t)$ by the differential equation [6]

$$\frac{dy(t)}{dt} + 2y(t) = x(t)$$

(i) Determine the frequency response $H(\omega) = Y(\omega)/X(\omega)$ and sketch the phase and magnitude of $H(\omega)$.

(ii) If $x(t) = e^{-t}u(t)$, determine $Y(\omega)$, the Fourier transform of the output.

(iii) Find $y(t)$ for the input given in part (ii).

- b) The output $y(t)$ of a continuous-time LTI system is found to be $2e - 3tu(t)$ when the input $x(t)$ is $u(t)$. [6]

(i) Find the impulse response $h(t)$ of the system.

(ii) Find the output $y(t)$ when the input $x(t)$ is.

- c) Explain the concept of Sampling and Reconstruction of Band-Limited Signals with appropriate waveform and example [6]

3) Solve any Two questions

- a) Determine the 4-point discrete Fourier Transform (DFT) of a discrete time sequence $\{1, 0, 2, 3\}$ [6]

- b) Consider an ideal low-pass filter with frequency response [6]

(i) Find the output $y(t)$ for $a < \omega_c$

(ii) Find the output $y(t)$ for $a > \omega_c$

(iii) In which case does the output suffer distortion?

$$H(\omega) = \begin{cases} 1 & |\omega| < \omega_c \\ 0 & |\omega| > \omega_c \end{cases}$$

$$x(t) = \frac{\sin at}{\pi t}$$

- c) State and explain the sampling theorem with derivation. [6]

4) Solve any Two questions

- a) Find the Fourier transform of a gaussian pulse signal $x(t) = e^{-at^2}$ $a > 0$ [6]
- b) List the different properties of Z-transform and prove any one property prove any one of it. [6]
- c) convolute two sequences $x[n] = \{1,2,3\}$ & $h[n] = \{-1,2,2\}$ using circular convolution [6]

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