

G.R. No.

DECEMBER 2021 - ENDSEM EXAM
S. Y. B. TECH. (E&TC) (SEMESTER - I)
COURSE NAME: Signals and Linear Systems
COURSE CODE: ETUA21205
(PATTERN 2020)

Time: [1Hr]

[Max. Marks: 30]

(*) Instructions to candidates:

- 1) Answer Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator is allowed
- 4) Use suitable data where ever required

Question
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- Q.1 a Evaluate the Frequency response of the following systems with the following impulse responses and decide the type of filtering operation system performs [4]

(i) $h(t) = \delta(t) - \delta(t - 2),$

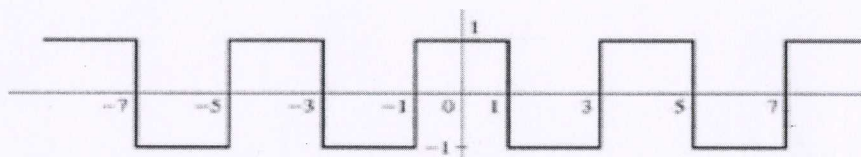
(ii) $h(t) = 2 \text{ rect}(t/2),$

- Q.1 b Determine FT of the signal given below **using appropriate properties** [6]

i) $x(t) = e^{-2t}u(t - 2)$

ii) $x(t) = \text{sgn}(t) - \text{sgn}(-t)$

- Q2 a Evaluate Trigonometric Fourier Series for the periodic signal show below [4]



- Q2 b Apply appropriate properties of FT to obtain the FT of the signal given below [6]

$$y(t) = \frac{d}{dt} \left\{ t e^{-3t} \cdot u(t) * e^{-2t} \cdot u(t) \right\}.$$

- Q.3 a Estimate initial and final values of the function $x_1(t)$ whose Laplace transform are specified below. [4]

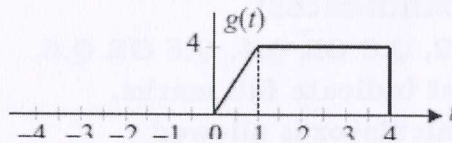
$$X_1(s) = \frac{s}{(s^2 + w_0^2)} \text{ with ROC: } \operatorname{Re}\{s\} > 0$$

- Q.3 b Following differential equation is used to describe RLC circuit [6]

$$\frac{d^2 w}{dt^2} + 7 \frac{dw}{dt} + 12w(t) = 12x(t)$$

Evaluate overall response of the system produced by the input $x(t) = 2e^{-t}u(t)$ given initial conditions $w'(0^-) = 5$ and $w(0^-) = 0$

- Q.4 a **Using Linearity property** Laplace Transform of Causal Function determine LT of the signal shown in figure. [4]



- Q.4 b Given Laplace Transform pair [6]

$$\cos(w_0 t) u(t) \leftrightarrow \frac{s}{(s^2 + w_0^2)} \text{ with ROC: } \operatorname{Re}\{s\} > 0$$

Derive unilateral Laplace transform of $\sin(w_0 t) u(t)$

using integration property.

- Q.5 a Evaluate autocorrelation of the following signal [4]

$x[n] = \{1, 3, 2, -2\}$ **using graphical method**

- Q.5 b Calculate and Verify ESD of the following signal $x(t) = 2 \operatorname{rect}(t/4)$ [6]

- Q.6 a Obtain the cross correlation of following two sequences, [4]

$x_1[n] = \{2, 3, 4\}$ and $x_2[n] = \{1, 2, 3\}$ **using graphical**

method only

- Q.6 b Evaluate and verify the PSD of the signal $x(t) = 5 \sin(100\pi t)$ [6]