

Total No. of Questions—8]

[Total No. of Printed Pages—4+1

Seat No.	
-------------	--

[4957]-1041

S.E. (Electronics/E & TC) (First Semester) EXAMINATION, 2016

SIGNALS AND SYSETMS

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

- N.B. :-** (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
(ii) Neat diagrams must be drawn wherever necessary.
(iii) Figures to the right indicate full marks.
(iv) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
(v) Assume suitable data, if necessary.

1. (a) Determine even and odd components of : [6]
(i) $x[n] = \{1, 1, \underset{\uparrow}{-1}, 1, 2\}$
(ii) $x(t)$ in Fig. 1.

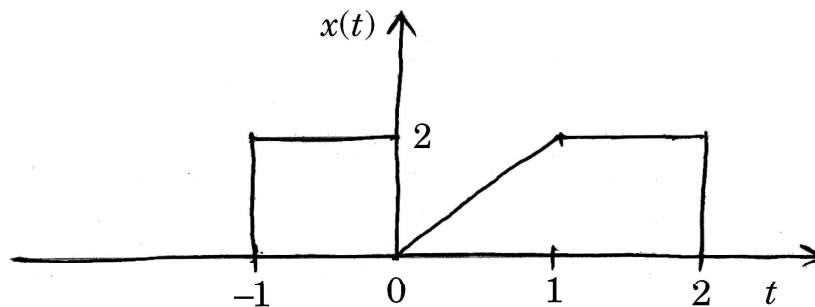


Fig. 1

P.T.O.

- (b) Determine the convolution integral of the following signals : [6]

$$x(t) = e^{-3t} u(t)$$

$$h(t) = 1, \quad 0 \leq t \leq 2.$$

Or

2. (a) Check whether the following system is : [6]

- (i) Static/dynamic
- (ii) Linear/non-linear
- (iii) Time invariant/time variant
- (iv) Stable/unstable.

$$y[n] = \cos(x[n - 2]).$$

- (b) Check whether the systems with impulse responses given below are : [6]

- (i) Static/dynamic
- (ii) Causal/non-causal
- (iii) Stable/unstable.

(1) $h[n] = u[n]$

(2) $h(t) = e^{-4t} u(t).$

3. (a) Determine the trigonometric Fourier series of the signal given in Fig. 2. [6]

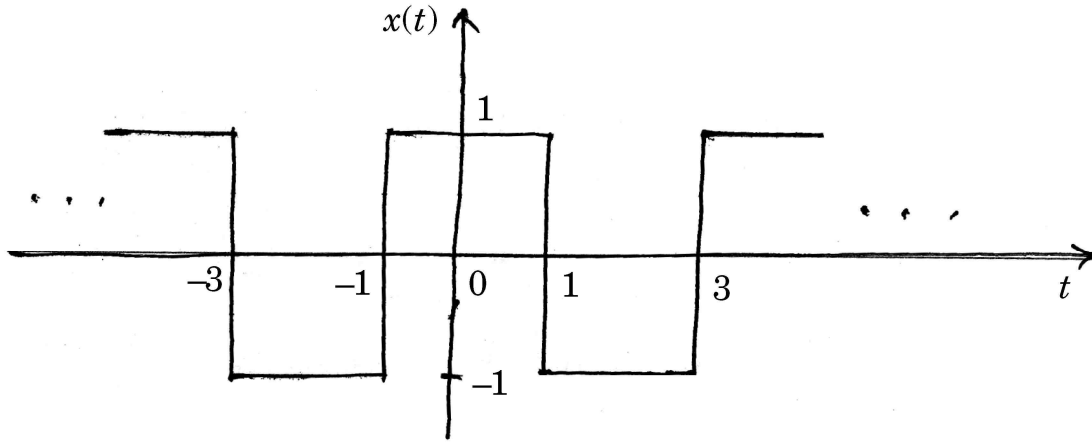


Fig. 2

- (b) Determine Laplace transform of the following signals : [6]

(i) $x(t) = \int_{-\infty}^t e^{-3\tau} \sin 4\tau u(\tau) d\tau$

(ii) $x(t) = e^{-4t}u(t) * e^{-2t}u(t).$

Or

4. (a) Determine Fourier transform of the following signals : [6]

(i) $x(t) = \frac{d}{dt} e^{-2t} u(t)$

(ii) $x(t) = \text{rect}\left(\frac{t}{2}\right) \cos \omega_0 t.$

- (b) Determine the initial and final values of the signal having Laplace transform : [6]

$$X(s) = \frac{s + 4}{s^2 + 2s + 3}.$$

5. (a) State properties of cross-correlation and prove that : [6]

$$R_{xy}(\tau) = R_{xy}(-\tau).$$

- (b) Determine autocorrelation and energy of the signal given by : [7]

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

Calculate energy from autocorrelation.

Or

6. (a) Determine autocorrelation of the sequence : [6]

$$x[n] = \{1, 2, -1, -1\}.$$

Also verify that the energy E is :

$$E = R_{xx}(0).$$

- (b) Determine power spectral density (PSD) of the signal and determine its power using the relation between PSD and power : [7]

$$x(t) = A \sin \omega_0 t.$$

7. (a) State and explain the properties of probability density function (PDF). [6]

- (b) For the cumulative distribution function (CDF) given below : [7]

$$\begin{aligned}f_x(x) &= 0, \quad x < 0 \\ &= kx^2, \quad 0 \leq x \leq 10 \\ &= 50k, \quad x > 10\end{aligned}$$

Determine k , PDF, $P(2 \leq X \leq 4)$, $P(X \leq 5)$.

Or

8. (a) Sketch and explain uniform distribution and determine its mean and variance. [6]
- (b) For the PDF given by : [7]

$$\begin{aligned}f_x(x) &= kx, \quad -1 \leq X \leq 2 \\ &= 0, \quad \text{otherwise}\end{aligned}$$

Find k , CDF, $P(-1 \leq X < 1)$, $P(X > 1)$.