Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4857]-1041

S.E. (Electronics/E&TC) (I Sem.) EXAMINATION, 2015

SIGNALS AND SYSTEMS

(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** and 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*) Check whether the following signals are energy or power. Also find the values of energy or power : [6]

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

(*ii*) $x[n] = \left(\frac{1}{2}\right)^n u[n]$

(*b*) Determine the convolution sum of the following sequences using equation of convolution sum. [6]

(*i*) $x[n] = \{1, \underset{\uparrow}{1}, 2, 1\}$

(*ii*) $h[n] = u[n] - u[n - 3]$

P.T.O.

Or

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

(*i*) Static/dynamic

(*ii*) Causal/non-causal

(*iii*) Linear/Non-linear

(*iv*) Time invariant/Time variant

$$y(t) = e^{tx(t)}$$

(*b*) For the system shown in Figure No. 1, determine the overall impulse response if $h_1(t) = u(t)$, $h_2(t) = h_5(t) = \delta(t)$, $h_3(t) = \delta(t + 2)$, $h_4(t) = \delta(t - 2)$. [6]

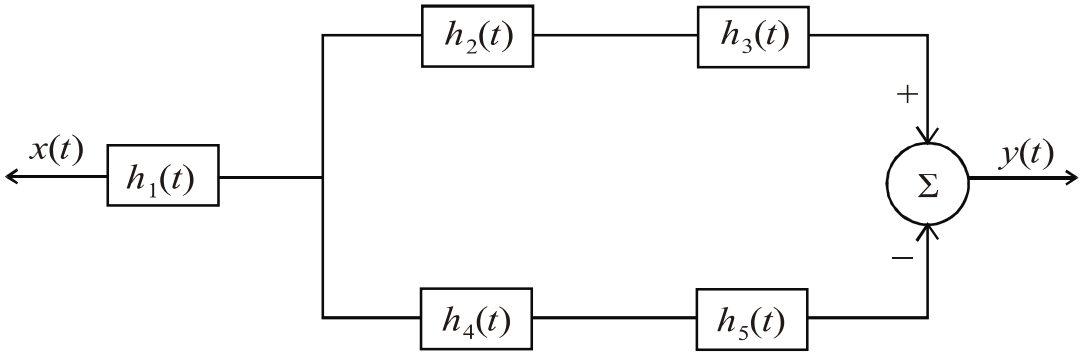


Fig. 1

3. (*a*) Find trigonometric Fourier series of the signal shown in Figure No. 2 [6]

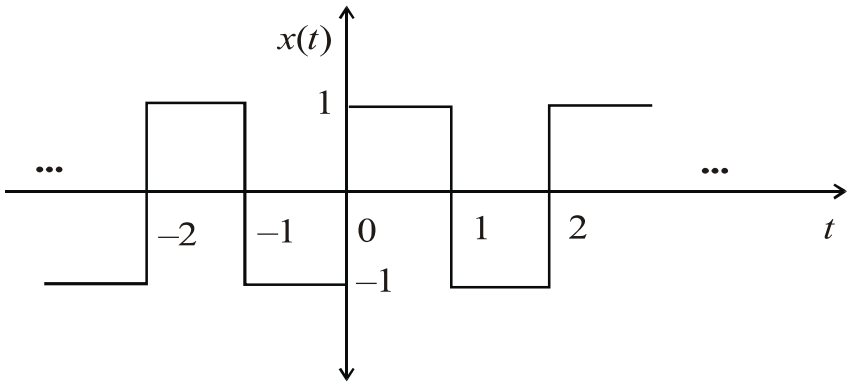


Fig. 2

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

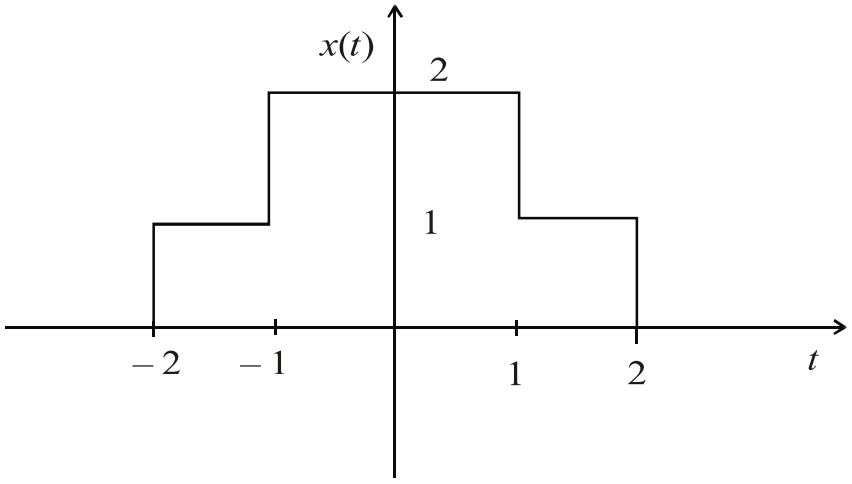
$$X(s) = \frac{2s + 3}{s^3 + 2s^2 + 5s}$$

Or

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

(*i*) $x(t) = e^{-3|t|}$

(*ii*)



(*b*) Determine transfer function and impulse response of the system represented by :

$$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = 3\frac{dx(t)}{dt} + 2x(t)$$

Assume zero initial conditions. [6]

5. (*a*) State and prove any *three* properties of Energy spectral density (ESD). [6]

(*b*) Find autocorrelation and power of the signal. [7]

$$x(t) = 3\cos \omega_0 t$$

Or

6. (*a*) Determine the cross correlation of the given signals by graphical method only. [6]

(*i*) $x_1[n] = \{1, \underset{\uparrow}{2}, 1\}$

(*ii*) $x_2[n] = \{2, \underset{\uparrow}{1}, 2\}$

(*b*) Determine ESD of the given signal and determine its energy using the relation between ESD and energy : [7]

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

7. (*a*) State and explain the properties of cumulative distribution function (CDF) [6]

(*b*) Determine mean, mean square, variance and standard deviation for the given probability density function (PDF) : [7]

$$f_x(x) = x^2 \text{ for } 0 \leq x \leq 1$$
$$= 0 \qquad \text{otherwise}$$

Or

8. (*a*) A box contains five white balls, 6 blue balls and three yellow balls. A ball is drawn at random. Find probability that : [6]

(*i*) ball is not yellow

(*ii*) ball is either white or yellow

In the second random experiment if two balls are drawn in succession, then what is the probability that the second ball is blue if the first ball is white.

(*b*) For the CDF given by, [7]

$$F_x(x) = 0 \quad , \quad x < 0$$

$$= \frac{2x}{5}, \quad 0 \leq x \leq 2$$

$$= k \quad , \qquad x > 2$$

Find k, PDF, $P(1 < X \leq 2)$, $P(X > 2)$