2017

ELECTRONICS

(General)

(Signals and System)

Full Marks : 80

Time : 3 hours

The figures in the margin indicate full marks
for the questions

1. Answer the following :   1×10=10

    (a) What is a signal?

    (b) Draw a unit step function.

    (c) Give the expression of Fourier transform.

    (d) For which class of signals, Fourier transform is required?

    (e) Draw a periodic signal.

    (f) What is convolution?

    (g) How is a continuous signal converted to a discrete form?

    (h) What is aliasing?

    (i) What is time period of a signal?

    (j) Define a step function.

8A/164

(*Turn Over*)

2. Answer the following questions :   2×5=10

(a) Give an example of a causal system.

(b) Give an example of a complex signal.

(c) Why is a low-pass filter used before sampling?

(d) Define and draw the dirac delta function.

(e) What are the different types of Fourier transforms used for discrete signals?

3. Answer any *four* questions :   5×4=20

(a) $X(z) = \dfrac{1+z^{-1}}{1+5z^{-1}+6z^{-2}}$

Find the inverse z-transform.

(b) A system response is given as

$y(n) + 5y(n-1) + 6y(n-2) = x(n) + 2x(n-1)$

Find the transfer function of the system.

(c) State and prove the time reversal property of Fourier transform.

(d) State sampling theorem. What is Nyquist rate? How is aliasing prevented? Draw diagrams wherever necessary.

(e) Write a short note on correlation.

4. Answer any *four* questions :   10×4=40

(a) An analog signal is given as

$$x(t) = 3\cos 50\pi t + 10\sin 300\pi t$$
$$+ 10\sin 500\pi t$$

Sampling should be done using two times of the highest frequency of the signal. Using the sampling process thus obtained, derive the discrete signal produced.

(b) $y(n) = x(n) + 2x(n-1) + x^2(n)$

Check the linearity and causality of the system.

(c) Write a short note on DIT FFT.

(d) State and establish the following :

(i) Parseval's energy density theorem

(ii) Scaling   (time-frequency and amplitude)

(e) Write a short note on Fourier Series.

★ ★ ★