2018

M.Sc.

2nd Semester Examination

ELECTRONICS

PAPER—ELC-201

Subject Code—27

Full Marks : 50

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Signals and Systems)

Answer Q. No. *1* and any *three* from the rest.

1. (a) What do you mean by time invariant system ? 2

(b) What is essential bandwidth of a signal ? 2

(c) What is the relation between the input signal energy spectral density (ESD) and the output signal ESD ? 2

(d) What do you mean by distortionless transmission ? 2

(e) What is zero-padding ? 2

2. (a) What do you mean by autocorrelation and cross correlation ?

(b) Explain the significance of correlation functions.

(c) Establish the connection between convolution and correlation of two functions. (1½+1½)+3+4

3. (a) Derive the expression of the Fourier Integral to represent aperiodic signal. 6

(b) Find the zero-state response of a stable LTIC (Linear Time Invariant Continuous) system with transfer function $H(S) = \frac{1}{S+2}$ and the input $f(t) = e^{-t}u(t)$. 4

4. (a) State the relation between energy spectral density from autocorrelation function.

(b) Discuss about the nature of distortion in audio and video signals if both are sent through two channels of same capacity.

(c) Given $x(t) = e^{-3t}u(t)$. Determine its autocorrelation function $R_a(\tau)$. What is the energy in $x(t)$? Sketch $R_x(\tau)$.

4+2+(2+1+1)

5. (a) How one can design digital filters from analog filters ?

(b) Mention advantages and disadvantages of FIR (Finite Impulse Response) filters.

(c) Why impulse invariant method is not preferred in the design of IIR (Infinite Impulse Response) filter other than lowpass filter ?

3+(2+2)+3

6. (a) State the Schwarz inequality and show it with the help of example function.

(b) Form a set of three orthonormal vectors by the Gram-Schmidt process using these input vectors in the order given : (1+3)+6

$$C_1 = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}, \quad C_2 = \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}, \quad C_3 = \begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix}$$

[Internal Assessment — 10 Marks]

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