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Code No: EC1516

GEC-R14

II B. Tech I Semester Regular Examinations, November 2016

## SIGNALS AND SYSTEMS

(Electronics and Communication Engineering)

Time: 3 Hours

Max. Marks: 60

**Note:** All Questions from **PART-A** are to be answered at one place.

Answer any **FOUR** questions from **PART-B**. All Questions carry equal Marks.

### PART-A

6 × 2 = 12M

1. Find the signal energy and power of  $e^{-3|t|}$ .
2. What is even symmetry in Fourier series?
3. Derive time convolution property of Fourier Transform.
4. Define system bandwidth and signal bandwidth.
5. If  $\sin(\omega)$  is the input PSD, what is the PSD of the output of an ideal differentiator?
6. State final value theorem.

### PART-B

4 × 12 = 48M

1. a) A rectangular function  $f(t)$  is defined by

$$f(t) = \begin{cases} 1 & (0 < t < \pi) \\ -1 & (\pi < t < 2\pi) \end{cases}$$

Approximate this function by a wave form  $\sin t$  over the interval  $(0, 2\pi)$

such that the Mean square error is minimum. (6M)

- b) Prove Orthogonality in complex functions. (6M)
2. a) Find the exponential Fourier series of a rectified sine wave  
 $f(t) = A \sin \pi t \quad 0 < t < 1; \quad T = 1;$  (6M)  
b) Discuss complex Fourier spectrum of periodic functions. (6M)
3. a) Find Fourier Transform of an unit step function. (4M)  
b) Determine Fourier Transform of  $g(t) = A \text{ rect}(t/T)$ . (8M)
4. a) Derive relationship between rise time and bandwidth of LPF (RC) (6M)

- b) Discuss Impulse response of LTI system. (6M)
5. a) Calculate PSD and the average power of  $g(t)=A_1\cos(\omega_1t+\theta_1)+A_2\cos(\omega_2t+\theta_2)$  (6M)
- b) State properties of auto correlation function of energy signals. (6M)
6. Find Laplace Transform and sketch the pole-zero plots with ROC for the following signals?
- i)  $x(t)=e^{-2t} u(t)+ e^{-3t} u(t)$
- ii)  $x(t)= e^{-3t} u(t) + e^{2t} u(-t)$  (12M)

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