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# B.Tech.(EIE) (2011 & Onwards) (Sem.–4) SIGNALS AND SYSTEMS Subject Code : EC-206 M.Code : 57512

### Time: 3 Hrs.

Max. Marks : 60

### INSTRUCTION TO CANDIDATES :

- 1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

### **SECTION-A**

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#### Q1. Explain briefly :

- a) Define unit ramp signal.
- b) What is power spectral density?
- c) Sketch the following signal:

x(t) = A[u(t+a) - u(t-a)] for a > 0

- d) What is matched filter?
- e) How can you classify Random processes?
- f) What is meant by signum function? Explain.
- g) Explain the relationship between joint PDF and Probability.
- h) Define Analog Signal
- i) State the sampling theorem for low pass signals.
- j) An amplifier has a bandwidth of 4 MHz with  $10k\Omega$  as the input resistor. Calculate the RMS voltage at the input to this amplifier if the room temperature is 25°C.

## **SECTION-B**

- Q2. Find the Fourier transform of an Impulse function  $x(t) = \delta(t)$ . Also draw its spectrum.
- Q3. Show that a system with excitation x(t) and response y(t) described by y(t) = u(x(t)) is non-linear, time invariant, stable and non-invertible.

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Q4. Explain the joint probability function and its various properties.

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- Q5. What do you mean by noise? How can you classify the noise?
- Q6. A receiver having equivalent input noise resistance of  $2500\Omega$  and input resistance of  $500 \Omega$  is connected to an antenna of resistance  $50\Omega$  Calculate the noise figure in dBs and equivalent noise temperature of the receiver.

#### **SECTION-C**

Q7. Find the Fourier Transform of following signals x1(t) and x2(t)



- Q8. Explain what matched filter is. How it differs from optimum filter? Derive an expression for error probability of matched filter.
- Q9. A random variable X has PDF as:

$$f_x(x) = \begin{cases} \frac{\pi}{16} \cos\left(\frac{\pi x}{8}\right), & -4 \le x \le 4 \\ 0 & elsewhere \end{cases}$$

Find :

- a) Mean value
- b) Variance
- c) Mean Square value
- d) Standard deviation

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

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