

Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

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Uni. Roll No. ....

Program: B.Tech. (Batch 2018 onward)

Semester: 3<sup>rd</sup>

Name of Subject: Signals and Systems

Subject Code: PCEC-103

Paper ID: 16033

Scientific calculator is Allowed

MORNING

12 MAY 2023

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

**Part – A**

[Marks: 02 each]

Q1.

- a) Define system.
- b) What do you mean by Shot Noise?
- c) Differentiate between stationary and non-stationary processes.
- d) Obtain the Fourier Transform of a Unit Step Function.
- e) Show that the product of an even signal and an odd signal is an odd signal.
- f) Differentiate between marginal and conditional probability.

**Part – B**

[Marks: 04 each]

Q2. Find the Fourier transform of signal

$$x(t) = u(t) * \sin \omega t$$

Q3. Discuss the properties of LTI system.

Q4. Explain folding mathematically and graphically.

Q5. A certain random variable has the CDF function given by

$$\begin{aligned} F_X(x) &= 0 \text{ for } x \leq 0 \\ &= kx^2 \text{ for } 0 < x \leq 10 \\ &= 100k \text{ for } x > 10. \end{aligned}$$

- a. Calculate the value of " $k$ ".  
b. Find the values of  $P(x \leq 5)$  and  $P(5 < x \leq 7)$ .
- Q6. The signal to noise ratio at the input of an amplifier is 40dB. If the noise figure of an amplifier is 20dB, calculate the signal to noise ratio (in dB) at the amplifier output.
- Q7. State and prove time scaling property of Fourier series.

**Part – C****[Marks: 12 each]**

- Q8. Explain the different types of systems in detail.

OR

Explain the following

- a. Thermal Noise  
b. Partition Noise  
c. Low frequency of Flicker Noise
- Q9. State the expression of ESD at the output of the system in terms of system response and ESD at the system input.

OR

A three-digit message is transmitted over a noisy channel having the probability of error  $P(E) = 2/5$  per digit. Find the corresponding CDF.

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