

Code No.: R22EC305PC

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CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS

II-B.TECH-I-Semester End Examinations (Regular) - February- 2024
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(ECE)

[Time: 3 Hours]

[Max. Marks: 60]

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 10 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A

(10 Marks)

1. a) What is the condition for a function to be a random variable? [1M]
- b) The events A and B are mutually exclusive. Can they be independent? [1M]
- c) State central limit theorem. [1M]
- d) Explain Chebyshev's Inequality. [1M]
- e) Explain about strict-sense stationery processes. [1M]
- f) Define Gaussian random process. [1M]
- g) What is the output PSD of a system response $SY Y(w)$? [1M]
- h) What is power spectral density? [1M]
- i) Define the thermal noise. [1M]
- j) State Shannon Hartley theorem. [1M]

PART-B

(50 Marks)

2. a) State and prove Bayes' theorem. [6M]
- b) Consider the experiment of tossing two dice simultaneously. If X denotes the sum of two faces, find the probability for $X \leq 6$. [4M]

OR

3. a) Discuss about the Discrete and Continuous Sample Spaces. [5M]
- b) State and prove the properties of probability density function. [5M]
4. State and prove the properties of Joint density function. [10M]

OR

5. A random variable X has probabilities shown in table. [4M]

x	-3	-2	-1	0	1	2
P(x)	0.2	0.4K	K	0.3	0.1K	K

[6M]

i) Find the value of K. ii) Find $F_X(x)$ and draw the plot.

6. Given a random process $X(t) = A \cos(w_0 t) + B \sin(w_0 t)$ where w_0 is a constant and A and B are uncorrelated non-zero random variables having different density functions but the same variances. Show that X(t) is WSS. [10M]

OR

7. List and explain various properties of the Autocorrelation function. [10M]
8. Discuss the relationship between cross power spectrum and cross correlation function. [10M]

OR

9. List and Explain the properties of power spectral density (PSD). [10M]

10. Explain the following: [5M]
a) Noise figure. [5M]
b) Huffman Coding.

OR

11. Define entropy and mutual information. Derive the relationship between entropy and mutual information. [10M]
