R18

Code No: R18A0403

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, April 2023

Probability Theory and stochastic Process

(ECE)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1 *A* State and prove Bayes Theorem **[7M]**

B Define the terms outcome, event, sample space, mutually exclusive events. Consider the experiment of rolling of two fair dice simultaneously and represent its sample space. Also give examples of terms mentioned above related to this experiment. **[7M]**

OR

2 *A* Two dice are thrown. The square of the sum of the points appearing on the two dice is a random variable X. Determine the values taken by X, and the corresponding probabilities. **[7M]**

B Distinguish between discrete, continuous and mixed random variables with suitable examples. **[7M]**

SECTION-II

3 *A* Define conditional probability distribution function and write the properties. **[7M]**

B State and prove the properties of probability density function **[7M]**

OR

4 *A* Explain Gaussian random variable with neat sketches? **[7M]**

B State and prove the properties of cumulative distribution function (CDF) of **[7M]**

SECTION-III

5 *A* Write all the properties of joint density function. **[7M]**

B A joint probability density function is **[7M]**

$$f_{x,y}(x,y) = \frac{1}{24} \quad 0 < x < 6, 0 < y < 4$$
$$0 \quad \text{else where}$$

Find the expected value of the function g(X,Y)= (XY) 2

OR

6 *A* For two random variables X and Y **[10M]**

$$f_{X,Y}(x,y) = 0.15\delta(x+1)\delta(y)+0.1\delta(x)\delta(y)+ \ 0.1\delta(x)$$

$$\delta(y-2)+0.4\delta(x-1)\delta(y+2)+$$

$$0.2\,\delta(x-1)\delta(y-1)+0.5\,\delta(x-1)\delta(y-3).$$

Find the correlation coefficients of X and Y

B Joint Sample Space has three elements (1, 1), (2, 2), and (3, 3) with **[4M]** probabilities 0.4, 0.3, 0.3 respectively then draw the Joint Distribution Function diagram.

SECTION-IV

7 ***A*** Classify random processes and explain **[4M]**

B A random process is defined as $X(t) = ACos(\omega_o t + \Theta)$, where Θ is a uniformly distributed random variable in the interval $(0, \pi/2)$. Check for its wide sense stationarity? A and ω_o are constants. **[10M]**

OR

8 ***A*** A random process $Y(t) = X(t) - X(t+\tau)$ is defined in terms of a process X(t). That is at least wide sense stationary. **[5M]**

B a) Show that mean value of Y(t) is 0 even if X(t) has a non Zero mean value. b) If $Y(t) = X(t) + X(t+\tau)$ find E[Y(t)] and σ_Y^2 . **[9M]**

SECTION-V

9 The auto correlation function of a random process X(t) is **[14M]**

X(t) is $R_{XX}(\tau) = 3+2\exp(-4\tau^2)$.

a) Evaluate the power spectrum and average power of X(t). b) Calculate the power in the frequency band $-1/\sqrt{2} < \omega < 1/\sqrt{2}$

OR

10 ***A*** Obtain the average power in the random process $X(t) = A\cos(\omega_o t+\theta)$ where A, ω_o are real constants and θ is a random variable uniformly distributed in the range $(0, 2\pi)$. **[7M]**

B Define cross power density spectrum and write its properties **[7M]**

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