Hall Ticket Number :										

R-15

Code: 5G341

II B.Tech. II Semester Supplementary Examinations November 2023

Random Variables and Random Processes

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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UNIT–I

1. a) Consider the experiment of tossing two dice simultaneously. If X denotes the sum of two faces, find the probability for $X \leq 6$. 7M
   b) Discuss the Independent and mutually exclusive events with an example each. 7M

OR

2. a) State and prove Bayes Theorem. 7M
   b) In a box there are 100 resistors whose resistances and tolerances are as shown in the table below. Let A be the event of drawing a 47Ω resistor, B be the event of drawing a resistor with 5% tolerance, and C be the event of drawing a 100Ω resistor. Find P(A/B), P(A/C) and P(B/C). 7M

UNIT–II

3. a) Derive expressions for mean and variance for uniform random variable? 7M
   b) Find the Moment generating function of exponential distribution? 7M

OR

4. a) Obtain the characteristic function of Poisson random variable 8M
   b) Explain the following terms: (i) Variance. (ii) Skew. 6M

UNIT–III

5. a) Explain joint moments of two random variables. 7M
   b) Explain covariance of two random variables. 7M

OR

6. a) Verify the properties of joint characteristic function. 7M
   b) Two statistically independent random variables X and Y have mean values E[X] = 2 and E[Y] = 4. They have second moments $E[X^2] = 8$ and $E[Y^2] = 25$. Find Variance of W = 3X-Y 7M

UNIT–IV

7. a) List and explain various properties of Autocorrelation function 7M
   b) If x (t) is a stationary random process having mean = 3 and auto correlation function: $RXX(\tau) = 9 + 2^{|-\tau|}$. Find the mean and variance of the random variable. 7M

OR

8. a) Discuss in detail about: (i) First order stationary random process. (ii) Ergodic process. 6M
   b) X(t)=2ACos(Wct+2θ) is a random Process, where 'θ' is a uniform random variable, over (0,2π). Check the process for mean ergodicity 8M

UNIT–V

9. a) Discuss properties of cross power density spectrum 8M
   b) Derive the expression for average power of a random process x(t). 6M

OR

10. a) Derive the expression for power density spectrum of a random process 8M
    b) Prove the equation $S_{XY}(W) = S_{YX}(-W)$. 6M

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