Hall Ticket No | | | | | | | | | | Question Paper Code: AECB08

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech III Semester End Examinations (Regular), February – 2021

Regulation: IARE–R18

PROBABILITY THEORY AND STOCHASTIC PROCESS

Time: 3 Hours **(ECE)** **Max Marks: 70**

Answer any Four Questions from Part A
Answer any Five Questions from Part B

PART – A

1. State and prove Bayes theorem. **[5M]**
2. Give the expression for an arbitrary transformation of a single random variable, with a brief explanation. **[5M]**
3. What are the conditions for the 2-dimentional random variable to be uncorrelated and orthogonal? **[5M]**
4. Explain classification of random processes with neat sketches. **[5M]**
5. Explain any two properties of cross-power density spectrum of two random processes. **[5M]**
6. Distinguish between joint distribution and marginal distribution. **[5M]**
7. List any five properties of joint density function of two random variables. **[5M]**
8. State the properties of correlation between two random variables. **[5M]**

PART – B

9. Find M.G.F., mean and variance of binomial distribution. **[10M]**
10. A random variable X has the following probability distribution given in Table 1. Find :
    i) The value of a
    ii) Cumulative distribution
    iii) The smallest value of c for which P(X $\leq$ c) > 3/4. **[10M]**

Table 1

X	0	1	2	3	4	5	6	7
f(x)	0	a	2 a	2 a	3 a	a^2	$2a^2$	7 a^2 + a

11. Explain the significance of the moment generating function of a random variable. **[10M]**
12. Two coins are tossed. X denotes number of heads and Y denotes number of tails. Find
    i) Joint p.m.f.
    ii) Marginal p.m.f. of (X,Y)
    iii) P(X $\leq$ 1,Y = 1)
    iv) P(Y $\leq$ 1) **[10M]**
13. Show that random process X(t) = Acos(ωt + θ) is W.S.S.if A and ω are constants θ is uniformly distributed random variable in (0,2π). **[10M]**

14. If X(t) is a Gaussian process, with µ(t) = 10 and C(t_1, t_2) =16 Find the probability that

    i) X(10) $\leq$ 8

    ii) |X(10) − X(6)| $\leq$ 4 **[10M]**

15. Let {X(t);−∞ <t< ∞ } be a process with correlation function R(τ) = ce$^{-a|\tau|}$, c> 0, > 0. Find the spectral density of the process {X(t)}. **[10M]**

16. If S_{XX} (ω) and SYY (ω) are the p.s.d. function of the input x(t) and the output y(t) respectively and H(ω) is the system transfer function, then S_{YY} (ω) = |H(ω)|^2S_{XX} (ω). **[10M]**

17. Deduce the cross power spectral density of input and output random processes of a linear time invariant system. **[10M]**

18. A random process has the power density spectrum S_{XX}(w)=$w^2/(w^2$+1). Find the average power in the random process. **[10M]**

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