CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Supply)- June- 2022
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(ECE)

[Time: 3 Hours]   **[Max. Marks: 70]**

Note: 1. Answer *any FIVE* questions. Each question carries 14 marks.
        2. All questions carry equal marks.
        3. Illustrate your answers with NEAT sketches wherever necessary.

                                                         5X14=70

1. a) State and prove Bayes theorem of probability. [7M]
   b) Find the probability of the card being either red or a king when one card is drawn from a regular deck of 52 cards. [7M]

2. a) Define conditional distribution and density function of two random variables X and Y. [7M]
   b) State and prove any three properties of the moment generating function. [7M]

3. a) Define the autocorrelation function of a random process. Write properties of autocorrelation function of a WSS process and prove any three of them. [7M]
   b) X(t)=ACos(wt) is a random process, where 'A' is uniform random variable over (0, π). Test X(t) for stationary. [7M]

4. a) Derive the relationship between the cross-power spectrum and the cross-correlation function. [7M]
   b) Estimate the average power in the random process $X(t) = A\cos(\omega_0 t+\theta)$ where A, ω_0 are real constants and θ is a random variable uniformly distributed in the range $(0, 2\pi)$. [7M]

5. a) Show that a narrow band noise process can be expressed as in-phase and quadrature components of it. [7M]
   b) Explain different types of noise sources. [7M]

6. a) State and prove Addition law of Probability. [7M]
   b) A fair coin is tossed 3 times. Let X be a random variable that denotes the number of heads appearing in each outcome. Find and plot the CDF of X. [7M]

7. a) Obtain the moment generating function of a uniformly distributed random variable. [7M]
   b) Obtain the variance of the Rayleigh random variable. [7M]

8. a) Let X(t) be a random process with mean 3 and auto correlation $9+4.\exp(-0.2|\tau|)$. Find the mean, variance, and covariance of the random variables X(5) and X(8). [7M]
   b) Check random process X(t)=ACos(wt+β), where β is a uniform random variable over $(0, 2\pi)$ for mean ergodicity. [7M]

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