Code: 9A04303 **R09**

B.Tech II Year I Semester (R09) Supplementary Examinations June 2017

PROBABILITY THEORY & STOCHASTIC PROCESSES

(Common to EIE, E.Con.E & ECE)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1 (a) Define the following: (i) Joint probability. (ii) Event. (iii) Discrete sample space.
(b) Urn A contains 4 red balls and 8 white balls. Urn B contains 8 red balls and 4 white balls. If an Urn is selected at random and a ball is drawn, what is the probability that the ball is red?

2 (a) Define random variable.
(b) What are the conditions for a function to be a random variable?
(c) The probability mass function of X is given in the following table.

X	0	1	2	3	4	5	6
P(X)	k	3k	5k	7k	9k	11k	13k

Find (i) k. (ii) $P(3 < X \leq 6)$

3 (a) Explain the following terms:
(i) Variance (ii) Expectation.
(b) Find the moment-generating function of the random variable having probability density function
$f_X(x) = x, 0 < x < 1$
$= 2\text{-}x, 1 < x < 2$
$= 0\ elsewhere$

4 (a) Explain any three properties of joint distribution function.
(b) If X and Y are two random variables which are Gaussian, if a random variable Z is defined as Z = X+Y, find $f_z(z)$.

5 (a) Explain in detail about joint central moment.
(b) The joint density function of X and Y is

$$f_{X,Y}(x,y) = \begin{cases} \frac{1}{100}, & 0 < x < 5,\ 0 < y < 20 \\ 0, & elsewhere \end{cases}$$

Find the expected value of the functions: (i) XY and (ii) X^2Y.

6 (a) Explain how random processes are classified.
(b) Explain the concept of stationarity and statistical independence.

7 (a) Define the autocorrelation function and state any two of its properties.
(b) Briefly explain about Poisson random processes.

8 (a) Explain the concept of cross-power density spectrum.
(b) Find the auto-correlation function, if the power spectral density of a stationary random process is given by: $S_{XX}(\omega) = \begin{cases} A, & -k < \omega < k \\ 0, & otherwise \end{cases}$

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