

<b>4E4131</b>	Roll No.	Total No of Pages: <span style="border: 1px solid black; padding: 2px;">4</span>
<p><b>4E4131</b></p> <p><b>B. Tech. IV Sem. (Main) Exam., June/July-2014</b></p> <p><b>Electronics &amp; Communication Engg.</b></p> <p><b>4EC2A Random Variables &amp; Stochastic Processes</b></p>		

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 24

**Instructions to Candidates:-**

*Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

*Units of quantities used/ calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

1. \_\_\_\_\_

2. \_\_\_\_\_

**UNIT-I**

- Q.1. (a) A bag Contains 4 bad and 6 good mobile phones. Two are drawn out from the bag at a time. One of them is tested and found to be good. What is the probability that the other phone is also good? [8]
- (b) Prove the followings:-
- (i) If A and B are mutually exclusive events, then [4]  
 $P(A/B) = P(B/A) = 0$
- (ii) If  $P(A) > P(B)$  then [4]  
 $P(A/B) > P(B/A)$

**OR**

- Q.1. (a) What is meant by probability? How, it can be explained in various ways? [4]
- (b) Determine  $P(A/B)$ , if
- (i)  $A \cap B = \phi$  [4]
- (ii)  $A \subset B$  [4]
- (iii)  $B \subset A$  [4]

### UNIT-II

- Q.2. (a) What is a random Variable? Classify them. [6]
- (b) Explain the Binomial distribution. Also, calculate the mean and variance of Binomial distribution. [10]

### OR

- Q.2. (a) A continuous random variable can assume any value between  $x = 2$  and  $x = 5$ . It has a density function given by
- $$f_x(x) = k(1+x)$$
- Find  $P(x < 4)$ ? [6]
- (b) Explain the Rayleigh distribution. Also, calculate its mean and variance. [10]

### UNIT-III

- Q.3. (a) The joint pdf of a bivariate random variable is given by

$$f_{xy}(x,y) = \begin{cases} kx & ; 1 < x < 2 \\ y & ; 1 < y < 2 \\ 0 & ; \text{Otherwise} \end{cases}$$

Where K is a constant. Determine the value of K. Are X and Y independent? [10]

- (b) State and explain central limit theorem. [6]

### OR

Q.3. (a) The joint pmf of a bivariate random variable is given by

$$P_{xy}(x_i, y_j) = \begin{cases} k(2x_i + y_j) & ; \quad x_i = 1, 2 \\ & y_j = 1, 2 \\ 0 & ; \text{ Otherwise} \end{cases}$$

Where, K is a constant. Determine the value of K and also the marginal pmf's of x and y. [8]

(b) If X and Y are two random variable, given by  $X = \cos \psi$  and  $Y = \sin \psi$  where,  $\psi$  is another random variable, uniformly distributed over  $(0, 2\pi)$ . Show that, X and Y are uncorrelated. [8]

### UNIT-IV

Q.4. (a) Explain the strict and wide sense stationary random processes along with their necessary conditions. [8]

(b) Explain the auto correlation function. Also, prove that it is maximum at  $\tau = 0$ , i.e.

$$|R_{xx}(\tau)| \leq R_{xx}(0) \quad [8]$$

OR

Q.4. (a) Explain the random processes and classify them. [6]

(b) Explain the auto and cross covariance functions with necessary equations. [5×2= 10]

UNIT-V

Q.5. When a random process is transmitted through a linear system, calculate the mean and auto correlation function of output of LTI system. [16]

OR

Q.5. (a) Let  $X(t)$  be the WSS process with the auto correlation function given by

$$R_{XX}(\tau) = \left( \frac{A_0^2}{2} \right) \cos(W_0\tau)$$

Where,  $A_0$  and  $W_0$  are constants. Determine the power spectral density (psd) of  $X(\tau)$ . [8]

(b) Explain the power spectral density. Also, state and prove the various properties of psd. [8]

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