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4E 4131

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B.Tech. IV semester (Main&Back) Examination, May - 2018
Electronics & Comm.
4EC2A Random Variables & Stochastic Processes

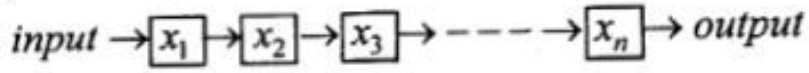
Time : 3 Hours **Maximum Marks : 80**
Min Passing Marks : 26

*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.*

Unit - I

1. a) Explain the following :
   i) Random experiments **(4)**
   ii) Sample space **(2)**
   iii) Events **(2)**

   b) In a system, there are n - components connected in series. This system works successfully when all units work successfully. The operation of each component is independent to each other. The probability of successful operation of the component is p_i where i = 1,2,3,....., n. Find the probability that the system functions satisfactorily. **(8)**



OR

1. a) Write down all the properties of joint and conditional probability **(8)**
   b) Explain the followings :
   i) Axiomatic Definition of probability **(4)**
   ii) Relative frequency definition of probability. **(4)**

Unit - II

2. Explain the classification of random variables in details. **(16)**

OR

2. Determine the mean and variance of the following r.v.
   a) Poisson random variable **(8)**
   b) Normal random variable **(8)**

Unit - III

3. a) Explain all the properties of joint density function **(6)**

b) The joint pdf of a bivariate R.V. (X, Y) is given by

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

a) determine k **(5)**

b) are X and Y independent **(5)**

OR

3. Consider the two random variable X and Y with joint pdf $f_{xy}(x,y)$. Let Z = X+Y

a) determine the pdf of Z **(12)**

b) determine the pdf of Z if X and Y are independent **(4)**

Unit - IV

4. Explain the followings ;

a) Properties of MGF **(8)**

b) Liapounoff's and Lindberg - Levy's form of central limit theorem. **(8)**

OR

4. Explain the followings ;

a) Covariance of multiple random variables ***(8)***

b) Co - relation co - efficient of multiple random variables. ***(8)***

Unit - V

5. If Y(t) be the output of an LTI system with impulse response h(t) when a WSS random process X(t) is applied as input show that

a) $S_{xy}(w)=H(w)S_{xx}(w)$ **(8)**

b) $S_{yy}(w)=H^{*}(w)S_{xy}(w)$ **(8)**

OR

5. Consider a N/w with the power transfer function $H(w)=jw$. *The input to this* N/w is WSS process X(t), Show that

a) $R_{xy}(\tau)=\frac{d}{dz}R_{xx}(\tau)$ **(8)**

b) $R_{yy}(\tau)=\frac{-d^2}{dz^2}R_{xx}(\tau)$ **(8)**