ET-V-old.
RSA

(OLD COURSE) QP Code : **11991**

(3 Hours) [Total Marks : 100]

N.B. : (1) Questions No. 1 is compulsory.
(2) Attempt any four out of remaining six questions.
(3) Assume suitable data wherever required and justify the same.

1. (a) Explain what is a moment generating function of a random variable. **20**
   (b) State and explain with example
      (i) Conditional Probability. (ii) Baye's Theorem.
   (c) State Important properties of power spectral density.
   (d) State central limit theorem and give it's significance.
   (e) Define markov chain and give an example of Markov chain.

2. (a) We have four Boxes. Box 1 contains 2000 components of which 5% are defective. Box 2 contains 500 components of Which 40% are defective. Box 3 and 4 contains 1000 each with 10% defective components . We select at random one of the boxes and we remove at random a single component. **10**
      (a) What is the probability that the selected component is defective?
      (b) Knowing that the selected component is defective, determine the probability that it come from box 2.
   (b) Define discrete and continuous random variables by giving examples. Discuss the properties of distribution function. **10**

3. (a) What do you mean by function of one Random variable. **10**

   Suppose $f_X(x) = \frac{2x}{\pi^2}, 0 < x < \pi,$

   and Y=sin X. Determine $f_Y(y)$

   (b) When do you say that two random variables X and Y are Statistically Independent. **10**

   $$f_{XY}(x, y) = \begin{cases} xy^2e^{-y}, & 0 < y < \infty, 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}$$

   Determine whether X and Y are Independent.

4. (a) Show that if input $\{x(t)\}$ is a wss process for a linear system then the output $\{y(t)\}$ is a wss process. Also find Rxy (τ) **10**
   (b) Examine whether the random process $\{x(t)\} = A\cos(\omega t + \theta)$ is a wide sense stationary if A and ω are constants and θ is uniformly distributed random variable in $(0,2\pi)$. **10**

TURN OVER