Hall Ticket Number:

Code No. : 22511

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. (I.T.) II Year II-Semester Main & Backlog Examinations, May-2017
Probability and Random Processes

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. Find P(A∩B), if P(A) ≤ 1-α and P(B) ≤ 1-α.
2. Find the probability of getting 53 Mondays in a leap year.
3. State the properties of cumulative distribution function.
4. Define Characteristic function of a random Variable and state its properties.
5. X is a random variable whose mean is 3 and variance is 2. Y is another random variable defined by Y = -6X + 22. Find mean and variance of Y.
6. Define Joint probability density function and state its properties.
7. State Wiener-Khinchine relationship.
8. Explain weakly stationary process.
9. State any three properties of power spectral density function.
10. Define Gaussian process.

Part-B (5 × 10 = 50 Marks)
(All bits carry equal marks)

11. a) Define total probability and derive its formula.

    b) A card is drawn from well shuffled pack of cards. If the card shows up red, one die is thrown and the result is recorded, but if the card shows black, two dice thrown and their sum is recorded. What is the probability that recorded number is 2.

12. a) Define Moment Generating function of a random variable. Determine the moment generating function of a random variable whose probability density function is given as $f_X(x) = \begin{cases} \frac{1}{b}e^{\frac{x-a}{b}}, x > a \\ 0, otherwise \end{cases}$.

    b) A Gaussian random variable X with mean 0.6 and standard deviation 0.8 is transformed to a new random variable by the transformation

    $$Y = T(X) = \begin{cases} 4 & \text{for } 1.0 \le X < \infty \\ 2 & \text{for } 0 \le X < 1.0 \\ -2 & \text{for } -1 \le X < 0 \\ -4 & \text{for } -\infty \le X < -1 \end{cases}$$

    Find mean and variance of Y.

13. a) Explain about conditional distributions.

    b) If the joint pdf of (X, Y) if $f(x,y) = 6e^{-2x-3y}$, x ≥ 0, y ≥ 0. Find the marginal density of X i.e. $f_X(x)$ and conditional density of Y given X i.e. $f_Y(y|x)$.

Contd... 2

14. a) Discuss the properties of cross power density spectrum.

    b) Let X(t) be a Wide sense stationary random process (WSSRP) with $R_{xx}(\tau) = \exp(-a|\tau|)$. Assume $Y(t) = X(t)\cos(\omega t + \varphi)$ where φ is uniform random variable on $(-\pi, \pi)$. Determine the auto correlation function of Y(t).

15. a) Give the representation of band pass noise.

    b) Derive the mean squared value of the response of a Linear Time Invariant System fed with a random process X(t) as input.

16. a) State and prove Bernoulli's theorem.

    b) A fair coin is tosses twice, and let the random variable X represent the number of heads. Find $F_X(x)$.

17. Write short notes on any ***two*** of the following:

    a) Bivariate distributions

    b) Covariance properties

    c) Poisson process.