

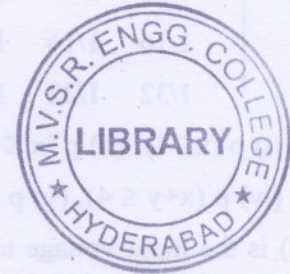
FACULTY OF ENGINEERING

B.E. II/IV Year (IT) II Semester (Main) Examination, May/June, 2011

PROBABILITY & RANDOM PROCESS

Time : 3 Hours]

[Max. Marks : 75

*Answer all questions from Part A.**Answer any five questions from Part B.***Part A – (Marks : 25)**

1. If A and B are independent events prove that $P(A^c \cap B)$ is also independent. L 3
2. A number is chosen at random from 200 numbers. Find the probability it is divisible by 4 or 6. 3
3. Define characteristic function and explain briefly. 3
4. State and prove addition Theorem for random variables. 3
5. Derive the characteristic function for $f(x) = k \begin{cases} a < x < b \\ a < b \end{cases}$ 2
6. Define probability function. 2
7. State Ergodicity and Stationarity. 3
8. State the Bivariate Gaussian process. 2
9. Define White Noise. 2
10. State the properties of Co-variance function. 2

Part B – (Marks : 50)

11. (a) State and prove Baye's Theorem. 4
- (b) Player A speaks truth 4 out of 7 times. A card is drawn from a pack of 52 cards, he reports that there is a club. Find if it was a club. 6
12. Given the r.v. x with density function $f(x) = 2x$ $0 < x < 1$ find the p.d.f. of $Y = 8x^3$ 4
- (b) Find mean and variance of the r.v. for p.d.f.
 $f(x) = \Phi e^{-\Phi x}$ $\Phi > 0 : x \geq 0$.
13. (a) Find the density function $f(x)$ corresponding to the characteristic function defined as : 5
$$\Phi(t) = \begin{cases} 1 - |t| & |t| \leq 1 \\ 0 & |t| > 1 \end{cases}$$
- (b) State the properties of power spectral density function. 5

14. If $x(t) = 5 \cos(10t + \Phi)$ and $Y(t) = 20 \sin(10t + \Phi)$ where Φ is a r.v. Uniformly distributed in $(0, 2\pi)$, prove that the processes $x(t)$ and $y(t)$ are jointly wide-stationary process. 10

15. (a) State the properties of cross correlation function. 4

(b) Find the power spectral density of a WSS process with auto correlation function $R(T) = e^{-\alpha T^2}$ 6

16. The joint probability function is given by

x/y	1	2	3	4	5	6
0	0	0	1/32	2/32	2/32	3/32
1	1/16	1/16	1/8	1/8	1/8	1/8
2	1/32	1/32	1/64	1/64	0	2/64

find (i) $p(x \leq 1)$ (ii) $p(x \leq 1, y \leq 3)$. (iii) $p(x \leq 1 / y \leq 3)$

(iv) $p(x+y \leq 4)$, (v) $p(y \leq 3 / x \leq 1)$

17. $X(t)$ is the input voltage to a circuit and $y(t)$ is the output voltage. If $x(t)$ is a stationary random process with $M_x = 0$; $R_{xx}(\tau) = e^{-2|\tau|}$ and Transfer function $H(w) = \frac{1}{w+2i}$ find $R_{yy}(\tau)$. 10