REG. NO

143

m-3 120

JAYA GROUP OF INSTITUTIONS

2ND SEM – B.E

INTERNAL ASSESSMENT – 3 (MODEL EXAMINATION- II)

Subject Name: Probability And Random Process
Subject Code: MA6451
Duration : 180 Minutes

Date : 11/04/2015
Branch : Common to All
Max Marks: 100

PART – A (10x2=20) answer all the Questions:

1. Establish the memory less property of the exponential distribution.
2. Find C If $P(X=n)=C\left(\frac{2}{3}\right)^n$ $n=1,2,3$ ....
3. Let X and Y be Continuous RVs with Joint pdf $f_{XY}(x,y)=\begin{cases}\frac{x(x-y)}{8} & ,0<x<2,-x<y<x\\ 0 & ,\ otherwise\end{cases}$ find $f_{X/Y}(x/y)$
4. Give a real life example each for positive correlation and negative correlation
5. Define: Markov Process
6. Define Random telegraph signal Process.
7. Find the mean and variance the stationary process $\{X(t)\}$ whose ACF IS $R(\tau)=16+\frac{9}{1+16\tau^2}$
8. Prove that for a WSS Process $\{X(t),\}$ $R_{xx}(t,t+\tau)$ Is Even function of τ.
9. Find system Transfer Function if the linear time invariant system has an impulse function $h(t)\begin{cases}\frac{1}{2c} ,|t|<c\\ 0 ,|t|\geq c\end{cases}$
10. Define: Time invariant System

PART – B (5 X 16 = 80) Answer all the Questions as per the Choice:

11. a)(i) The pdf of a R.V is given by $f(x)=\begin{cases}x, & 0<x<1\\ k(2-x), & 1<x<2\\ 0, & othewise\end{cases}$

i) Find the value of k ii) Find $P(0.2<X<1.2)$ iii) Find the Distribution Function of X iv)Find $P(0.5<X<1.5/X\geq 1)$ (8)

(ii) Derive the Mean, Variance, and MGF of the Binomial Distribution. (8)

(OR)

b(i) Given that X is distributed normally if $P(X<45)=0.31$ and $P(X>64)=0.08$ find the mean and standard deviation of the distribution. (8)

(ii) A Random Variable X has the following probability distribution function

x	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2k	3K	k^2	$2k^2$	$7k^2$+k

i) Find the value of k

ii) Evaluate P(X<6), P(X≥ 6)

iii) If P(X≤ c)>$\frac{1}{2}$ find the minimum value of c. (8)

12. a)(i)The joint pdf of the RV (X,Y) is given by $f(x,y) = kxye^{-(x^2+y^2)}$, $x > 0, y > 0$ find the value of k And $COV(X,Y)$. Are X and Y independent? (8)

(ii)If X and Y are independent RVs with density function, $f_x(x) = \begin{cases} 1, & 1 \le x \le 2 \\ 0, & otherwise \end{cases}$,

$f_y(y) = \begin{cases} \frac{y}{6}, & 2 \le y \le 4 \\ 0, & otherwise \end{cases}$ Find the density function of $Z = XY$ (8) (OR)

b(i)The Joint p.d.f of X and Y is given by $f(x,y) = \begin{cases} 2-x-y, & if\ 0 \le x \le 1,\ 0 \le y \le 1 \\ 0, & if\ otherwise \end{cases}$

Show that $Cov(X,Y) = -\frac{1}{144}$ (8)

(ii)Let X and Y be two R.V with the Joint p.d.f $f(x,y) = xy^2 + \frac{x^2}{8}$, $0 \le x \le 2, 0 \le y \le 1$

Compute i. $P(X > 1|Y = \frac{1}{2})$ ii. $P(X + Y \le 1)$ iii. $P(X < Y)$ (8)

13. a)(i)Examine whether the random process $\{X(t)\} = Acos(wt + \theta)$ is a WSS if A and w are constants and θ is uniformly distributed in $(0, 2\pi)$ (8)

(ii)Derive the probability law of Poisson process (8)

(OR)

b(i) If the WSS process $\{X(t)\}$ is given by $X(t) = 10\cos(100t + \theta)$ where θ is uniformly distributed over $(-\pi, \pi)$ prove that $\{X(t)\}$ is correlation ergodic. (8)

(ii) Find the Nature of the states of the markov chain with the tpm P= $\begin{bmatrix} 0 & 1 & 0 \\ 1/2 & 0 & 1/2 \\ 0 & 1 & 0 \end{bmatrix}$ (8)

14. a)(i)State and prove any four properties of autocorrelation function. (8)

(ii) Find the autocorrelation function and average power of the process $S_{XX}(\omega) = \frac{1}{(1+w^2)^2}$ (8)

(OR)

b(i)The cross-power spectram of a read R.P $\{X(t)\}$ and $\{Y(t)\}$ is

$s_{xy}(w) = \begin{cases} a + bjw, & for\ |w| < 1 \\ 0, & otherwise \end{cases}$ Find the cross correlation function. (8)

(ii)For the Process $X(t) = acos(bt + y)$ where y is the normally distributed over $(0, 2\pi)$ find the autocorrelation function and power spectral density. (8)

15. a)(i)Show that if the input $\{X(t)\}$ is a WSS process for a linear system then the output $\{Y(t)\}$ is a WSS (8)

(ii) A system has an impulse response $h(t) = e^{-\beta t}U(t)$ find the PSD for the $\{Y(t)\}$ corresponding to the Input $\{X(t)\}$ (8)

(OR)

b(i)Let X (t) be a WSS process which is the input to a linear time invariant system with unit impulse $h(t)$ and the Output $Y(t)$ and then prove that $S_{YY}(w) = |H(w)|^2 S_{XX}(w)$ (8)

(ii)Assume a R.P $X(t)$ is input to a system transfer function $H(w) = 1, -w_0 < w < w_0$ if the autocorrelation of the input Process $\frac{N_0}{2}\delta(t)$ find the auto correlation of the output process.

(8)

ALL THE BEST