Q. No	**Part-A (2 X 5 = 10 Marks)** **(Answer all the questions)**	CO
1	Consider a random process $X(t)=\cos(\omega_0 t+\theta)$ with θ uniformly distributed in the interval $(-\pi,\pi)$. Check whether $X(t)$ is stationary or not.	C
2	If the customers arrive at a bank according to a Poisson process with mean rate 2 per minute, find the probability that during a 1- minute interval no customers arrives.	C
3	The joint probability mass function of a two dimensional random variable *(X, Y)* is given *by P(x,y) = K (2x+y); x=1,2* and *y=1,2* where *K* is a constant. Find the value of *K*.	
4	State any two properties of poisson process.	
5	Define Markov Chain.	

Q. No	Part- B (16 X 2 = 32 Marks), (8 X 1 = 8 Marks) (Answer all the questions)
11 A	From the following data, find the two regression equations, coefficient of correlation b/w the marks in Economics(x) and Statistics(y) and Find the most likely marks in Statistics when marks in Economics are 30. x: 25, 28, 35, 32, 31, 36, 29, 38, 34, 32 y: 43, 46, 49, 41, 36, 32, 31, 30, 33, 39
	The random variables X and Y each follow exponential distribution with parameter 1 and are independent. Find the pdf of $U = X + Y,\ V = \frac{X}{Y}$.
	(OR)
11 B	Let X and Y be discrete R.V's with probability function $f(x, y) = \frac{x+y}{21}$, $x = 1,2,3; y = 1,2.$ Find Correlation coefficients.
	Suppose that orders at a restaurant are identically independent random variables with mean $\mu = 8$ and standard deviation $\sigma = 2$. (i)Find the probability that first 100 customers spend a total of more than 840. (ii) Find $P(780 < X_1 + X_2 + X_3 + ... + X_{100} < 820)$.
12 A	Show that the random process $X(t) = A\sin(\omega t + \theta)$ is WSS if A and ω are constant and θ is uniformly distributed random variable in $(0, 2\pi)$.
	A raining process is considered as a two state of Markov chain. If it rains, its considered to be in state 0 and it it does not rain, the chain is in state 1. The TPM of the Markov chain is defined as $P = \begin{pmatrix} 0.6 & 0.4 \\ 0.2 & 0.8 \end{pmatrix}$ (i) Find the probability that it will rain for three days from today assuming that its raining today. (ii) Find the probability that it will rain after 3 days with initial probability of state 0 & 1 are 0.4 & 0.6 respectively.
	(OR)
12 B	Find the nature of the states of the Markov chain $\{X_n\}$ with $n = 0,1,2$ having 3 states and with one step transition probability matrix $P = \begin{pmatrix} 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{pmatrix}$.
	A fisherman catches a fish at a Poisson rate of 2 per hour from a large lake with lots of fish. If he starts fishing at 10.00 a.m. What is the probability that he catches one fish by 10.30 a.m and three fishes by noon?
13 A	The joint probability mass function of (X,Y) is given by $p(x, y) = k(2x + 3y)$ for $x = 0,1,2; y = 1,2,3$. (i) Find all marginal distribution. (ii) Find conditional distributions of X given Y. (iii) Find $P[X + Y > 3]$. Are X and Y independent?