coming per minute. What is the probability that up to a minute will elapse unit 2 calls have come in to the switch board? (8)

12. (a) Given the joint density function

$$f(x,y)=\begin{cases} x\frac{(1+3y^2)}{4}, & 0<x<2, 0<y<1 \\ 0 & , elsewhere \end{cases}$$

Find the marginal densities $g(x), h(y)$ and the conditional density $f(x/y)$ and evaluate $P\left[\frac{1}{4}< x<\frac{1}{2}\Big/ Y=1/3\right]$.

Or

(b) (i) Determine whether the random variables X and Y are independent, given their joint probability density function as (8)

$$f(x,y)=\begin{cases} x^2+\frac{xy}{3}, & 0\le x\le 1,\ 0\le y\le 2 \\ 0 & , \text{otherwise} \end{cases}$$

(ii) If X and Y are independent random variables having density functions

$$f(x)=\begin{cases} 2e^{-2x} & , x\ge 0 \text{ and} \\ 0 & , x<0 \end{cases}$$

$$f(y)=\begin{cases} 3e^{-3y} & , y\ge 0 \\ 0 & , y<0 \end{cases},$$

respectively, find the density functions of $z=X-Y$. (8)

13. (a) (i) Show that random process $\{X(t)\}=A\cos t+B\sin t, -\infty < t < \infty$ is a wide sense stationary process where A and B are independent random variables each of which has a value -2 with probability $\frac{1}{3}$ and a value 1 with probability $2/3$. (8)

(ii) Derive probability distribution of Poisson process and hence find its auto correlation function. (8)

Or

(b) (i) Find the limiting-state probabilities associated with the following transition probability matrix.

$$\begin{bmatrix} 0.4 & 0.5 & 0.1 \\ 0.3 & 0.3 & 0.4 \\ 0.3 & 0.2 & 0.5 \end{bmatrix}.$$ (10)