**P3:**

**If $X$ and $Y$ are two random variables having j.p.d.f.**

$$f(x,y)=\begin{cases}\frac{1}{8}(6-x-y), & 0<x<2, \quad 2<y<4\\ 0 & , \quad otherwise\end{cases}$$

**Find (i) $P(X<1\cap Y<3)$ (ii) $P(X+Y<3)$ and (iii) $P(X<1|Y<3)$.**

***Solution:***

$$(i)\ P(X<1\cap Y<3)=\int_0^1\int_0^3 f(x,y)\,dxdy=\frac{1}{8}\int_0^1\int_2^3(6-x-y)\,dxdy=\frac{3}{8}$$

$$(ii)\ P(X+Y<3)=\frac{1}{8}\int_0^1\int_2^{3-x}(6-x-y)\,dxdy=\frac{5}{24}$$

$$(iii)\ P(X<1|Y<3)=\frac{P(x<1\cap y<3)}{P(y<3)}$$

$$But\ P(Y<3)=\frac{1}{8}\int_0^2\int_2^3(6-x-y)\,dxdy=\frac{5}{8}$$

$$Hence\ P(X<1|Y<3)=\frac{\frac{3}{8}}{\frac{5}{8}}=\frac{3}{5}$$