106. Solution: C

The joint pdf of X and Y is $f(x,y) = f_2(y|x)\, f_1(x)$

$= (1/x)(1/12),\ 0 < y < x,\ 0 < x < 12$.

Therefore,

$$E[X] = \int_0^{12}\int_0^{x} x \cdot \frac{1}{12x}\, dy dx = \int_0^{12} \frac{y}{12}\Big|_0^x \, dx = \int_0^{12} \frac{x}{12}\, dx = \frac{x^2}{24}\Big|_0^{12} = 6$$

$$E[Y] = \int_0^{12}\int_0^{x} \frac{y}{12x}\, dy dx = \int_0^{12} \left[\frac{y^2}{24x}\right]_0^x \, dx = \int_0^{12} \frac{x}{24}\, dx = \frac{x^2}{48}\Big|_0^{12} = \frac{144}{48} = 3$$

$$E[XY] = \int_0^{12}\int_0^{x} \frac{y}{12}\, dy dx = \int_0^{12} \left[\frac{y^2}{24}\right]_0^x \, dx = \int_0^{12} \frac{x^2}{24}\, dx = \frac{x^3}{72}\Big|_0^{12} = \frac{(12)^3}{72} = 24$$

$\mathrm{Cov}(X,Y) = E[XY] - E[X]E[Y] = 24 - (3)(6) = 24 - 18 = 6$.