6a) (i) $\dfrac{\lambda^k e^{-\lambda}}{k!}$

(ii) $\begin{cases} p & \text{if } k = 1 \\ 1-p & \text{if } k = 0 \end{cases}$

(iii) $\dbinom{n}{k} p^k (1-p)^{n-k}$

b) (i) $X \sim \text{Ber}(\frac{3}{5})$

$\text{E}(X) = \frac{3}{5}$

$\text{Var}(X) = \frac{6}{25}$

(ii) $Y \sim \text{Hyp}(2000, 50, 1200)$

$\text{E}(X) = 30$

$\text{Var}(X) = 12$

(iii) $Z \sim \text{Pois}(3)$

$\text{E}(X) = 3$

$\text{Var}(X) = 3$

c) (i)

$y \setminus x$	-1	0	$+1$	$\text{P}[Y = y]$
-1	0	$1/4$	0	$1/4$
0	$1/4$	0	$1/4$	$1/2$
$+1$	0	$1/4$	0	$1/4$
$\text{P}[X = x]$	$1/4$	$1/2$	$1/4$	1

(ii) $\text{E}[X] = 0, \text{E}[Y] = 0$

(iii) Two discrete random variables S and T are independent if for all values a, b:

$$\text{P}[S = a, T = b] = \text{P}[S = a] \cdot \text{P}[T = b]$$

X and Y are not independent above, since for example
$\text{P}[X = 0, Y = 0] \neq \text{P}[X = 0] \cdot \text{P}[Y = 0]$

(iv) The covariance of two random variables S and T is:

$$\text{Cov}[S, T] = \text{E}[(S - \text{E}[S]) \cdot (T - \text{E}[T])].$$

X and Y above have a covariance of 0, since one of X or Y is always zero, so $(S - 0) \cdot (T - 0)$ will always evaluate to zero.