Question 5

(a) X is a discrete random variable that follows geometric distribution. PMF of X:

$$P_X(x) = \begin{cases} p(1-p)^{x-1} & x = 1, 2, 3, \dots \\ 0 & \text{otherwise} \end{cases}$$

(b) T is a discrete random variable with the set of possible values:

$$T = 2X \Rightarrow X = \frac{T}{2}$$

PMF of T:

$$P_T(t) = \begin{cases} p(1-p)^{\frac{t}{2}-1} & t = 2, 4, 6, \dots \\ 0 & \text{otherwise} \end{cases}$$

(c)

$$E[T] = E[2X] = 2E[X] = \frac{2}{p}$$