Stochastic Process
Assignment (Week 2)

1. If X has $N(\mu, \sigma^2)$. Then, distribution of $Y = a - bX$ is
   (a) $N(a - b\mu, a - b\sigma^2)$ (b) $N(a - b\mu, a + b\sigma^2)$ (c) $N(a - b\mu, b^2\sigma^2)$ (d) $N(a + b\mu, a^2 + b^2\sigma^2)$

2. Let X be the life length of an electron tube and suppose that X may be represented as a continuous random variable which is exponentially distributed with parameter λ. Let $p_j = P(j \leq X < j + 1)$ which is of the form $(1 - \alpha)\alpha^j$. Then, value of α is
   (a) $\alpha = e^{\lambda}$ (b) $\alpha = e^{-\lambda}$ (c) $\alpha = \lambda$ (d) $\alpha = \frac{1}{2}$

3. Let X be a continuous random variable with CDF $F_X(x)$. Define $Y = F_X(X)$. Then, the distribution of Y is
   (a) $N(0, 1)$ (b) $exp(1)$ (c) $U(0, 1)$ (d) $C(0, 1)$

4. Consider a random variable X with $E(X) = 1$ and $E(X^2) = 1$. Then, $P(-1/2 < X \leq 3)$ equals
   (a) 1 (b) 0 (c) 0.5 (d) 0.25

5. The moment generating function of a discrete random variable X is given by $M_X(t) = \frac{1}{6} + \frac{1}{2}e^{-t} + \frac{1}{3}e^{t}$. If μ is the mean and σ^2 is the variance of this random variable, then value of $P(\mu - \sigma < X < \mu + \sigma)$ equals
   (a)$\frac{1}{3}$ (b) $\frac{2}{3}$ (c) $\frac{1}{6}$ (d) $\frac{5}{6}$

6. For what values of k, $f(x) = (1 - k)k^x$ serve as the probability distribution of a random variable x when $x = 0, 1, 2, \ldots$
   (a) 1 (b) 0 (c) 0.5 (d) 0.25

7. Let X be a continuous random variable with pdf

$$f(x) = \begin{cases} \alpha + \beta x^2, & 0 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

   If $E(X) = 3/5$, then the value of α and β is
   (a) $\alpha = \frac{3}{5}, \beta = \frac{6}{5}$ (b) $\alpha = \frac{6}{5}, \beta = \frac{3}{5}$ (c) $\alpha = \frac{2}{5}, \beta = \frac{3}{5}$ (d) $\alpha = \frac{3}{5}, \beta = \frac{2}{5}$

8. If X is uniform distributed random variable in $(0, 1)$, then distribution of $Y = -2 \ln X$ is
   (a) Exponential (b) Normal (c) Binomial (d) Cauchy