Department of Mathematics
MTL 106 (Introduction to Probability and Stochastic Processes)
Tutorial Sheet No. 2
Answer for selected Problems

2. a)No b)No c)Yes

3. a) 0.002 b) 0.7255

5. $\alpha = 1 - p, \quad 0 < p < 1$

6. $\alpha = \frac{1}{10}; \quad \beta = \frac{3}{64}; \quad P(X < 3/X \geq 2) = \frac{1}{2}$

7. $f_X(x) = \begin{cases} \frac{2x}{r_2^2 - r_1^2}, & r_1 \leq x \leq r_2 \\ 0, & \text{otherwise} \end{cases}$

9. a) 0.75 b) 0.5

10. N_t: Number of accidents in Delhi roads in time $(0, t]$

    a)$P[N_{15} = 4] = \frac{e^{-\lambda t}(\lambda t)^4}{4!} = 0.1898$ where $\lambda = \frac{9}{30}, \quad t = 15$
    b)$\frac{P[N_8 = 0, N_7 = 4]}{P[N_{15} = 4]} = 0.0474$

11. $(1 - 0.001)^{1200}$

12. $P[N_t = k] = \begin{cases} {}^nC_k(e^{-\lambda t})^k(1 - e^{-\lambda t})^{n-k}, & k = 0, 1, 2, \ldots, n \\ 0, & \text{otherwise} \end{cases}$

13. $1 - [\ {}^4C_1 p^1\ (1-p)^3 + \ {}^4C_0(1-p)^4\ p^0]$, where $p = P[X > 20]$

14. (a) Yes (b) not necessarily a probability density function

15. $P[X \geq 2] = [1 - [(1-p)^n + \ {}^nC_1 p^1 (1-p)^{n-1}]] \geq 0.95$ where $p = 0.001$
    $n \simeq 4742$

16. $[1 - (0.95)^{52} - {}^{52}C_1(0.05)(0.95)^{51}]$

17. $F_X(x) = \alpha F_d(x) + (1 - \alpha)F_c(x)$ where $\alpha = \frac{1}{2}$,

$$F_d(x) = \begin{cases} 0, & x < 1 \\ \frac{2}{25}, & 1 \leq x < 2 \\ \frac{4}{5}, & 2 \leq x < 3 \\ 1 & x \geq 3 \end{cases} \quad ; \quad F_c(x) = \begin{cases} 0, & 0 \leq x < 2 \\ \frac{(x^2 - 4)}{5}, & 2 \leq x < 3 \\ 1, & x \geq 3 \end{cases}$$

18. $e^{-0.4}$

19. $a)D_2 \quad b)D_2$