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

1. $X(i) = i, i = 0, 1, 2$
2. $\mathcal{F} = P(\Omega)$
3. a)No b)No c)Yes
4. (a) 0.002 (b) 0.7255
5. $\frac{5}{9}$
6. $F_X(x) = \alpha F_d(x) + (1-\alpha)F_c(x)$ where $\alpha = \frac{1}{2}$,

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

7. $\alpha = \frac{1}{10}$; $\beta = \frac{3}{64}$; $P(X < 3/X \ge 2) = \frac{1}{2}$
8. $[1 - (0.95)^{52} - {}^{52}C_1(0.05)(0.95)^{51}]$
9. $P[X \ge 2] = [1 - [(1-p)^n + {}^nC_1 p^1 (1-p)^{n-1}]] \ge 0.95$ where $p = 0.001$
   $n \simeq 4742$
10.
11. $\exp(-p)$
12. $(1 - 0.001)^{1200}$
14. $\alpha = 1 - p, \quad 0 < p < 1$
15. $f_X(x) = \begin{cases} \frac{2x}{r_2^2 - r_1^2}, & r_1 \le x \le r_2 \\ 0, & \text{otherwise} \end{cases}$
17. 0.99997
18. (a) yes (b) no
19. Mean$=\frac{1}{T}\left(1 - e^{-\frac{1}{4}}\right)$
    Variance $=\frac{1}{T}\left(1 - e^{-\frac{1}{4}}\right)$
20. a) 0.75 b) 0.5
21. $P[N_t = k] = \begin{cases} {}^nC_k (e^{-\lambda t})^k (1 - e^{-\lambda t})^{n-k}, & k = 0, 1, 2, \ldots, n \\ 0, & \text{otherwise} \end{cases}$
22. (a) 91.6% (b)56.8%
23. (a)D_2 , (b)D_2
24. $\frac{1-p}{\lambda}(1 - \exp(-4\lambda))$
28. (a) 0, (b) 1, 0
29. $\alpha = \frac{3}{5}, \beta = \frac{6}{5}$
30. 1