FISAC-1 : Take Home assignment questions

1. In a bombing action there is 50% chance that any bomb will strike the target. Two direct hits are needed to destroy the target completely. How many bombs are required to be dropped to give a 99% chance or better of completely destroying the target.?
2. The life of a lamp produced by a factory is distributed normally with mean 1000 hours and standard deviation of 200 hours. If 10,000 lamps are fitted on the same day, find the number of lamps which might be expected to fail
   (i) in the first 800 hours
   (ii) between 800 and 1200 burning hours.
   After what period of burning hours would you expect that
   (iii) 10% of the lamps would fail?
   (iv) 10% of the lamps would still burn?
3. When the mean was 50 and standard deviation was 5, 60% of the students failed in the exam. Determine the grace marks to be awarded in order to show that 70% of the students have passed. Assume that the marks follow normal distribution.
4. A two-dimensional random variable (X, Y) is uniformly distributed over the region R formed by the parallelogram with the vertices (1, 1),(3, 1),(0, 0) and (2, 0). Find the marginal pdf's of X and Y. Also find correlation coefficient between X and Y.
5. In a factory, turning out of optical lenses , there is a small chance of 1/200 for any lens to be defective. The lenses are supplied in a packet of 10. Calculate the approximate number of packets containing no defective, one defective, two defective and 3 defective lenses in a consignment of 20,000 packets.
6. Suppose that 0.01% of the population of the city with population 10,000 suffers from certain disease. Find the probability that there is at least two persons, who suffer from the disease. If there are 10 such cities in state, what is the probability that at least one city will have at least one person who suffer from the disease.
7. The weekly wages of workers in a certain factory was found to be normally distributed with mean $Rs.$ 500 and standard deviation $Rs.$ 50. There are 228 persons getting at least $Rs.$ 600. Find the number of workers in the factory.
8. If X, Y, Z are uncorrelated random variables with zero means and standard deviations 5,12 and 9 respectively and U = X +Y and V = Y + Z, find the correlation coefficient between U and V.
9. A two-dimensional random variable (X, Y) is uniformly distributed over the region R formed by the Rhombus with the vertices (0, 1),(0, -1),(1, 0) and (-1, 0). Find the marginal pdf's of X and Y. Also find conditional pdf of X given Y= y and conditional pdf of Y given X = x.
10. The mileage which car owners get with a certain kind of radial tyre is a random variable having an exponential distribution with mean 40,000 km. Find the probabilities that one of these tyres will last i) at least 20,000 km ii) at most 30,000 km.