Probability Tutorial Sheet C

1. A new test has been developed to diagnose a particular disease. If a person has the disease, the test has a 98% chance of identifying them as having the disease. If a person does not have the disease, the test has a 4% chance of identifying them as having the disease. 3% of the population have this disease. Suppose we select a person at random from the population.

   (i) What is the probability that the test will identify them as having the disease?

   (ii) What is the probability that the person has the disease given that the test identifies them as having the disease?

2. An electronics assembly subcontractor receives its entire supply of resistors from two suppliers. Company A provides 70% of the subcontractor's resistors, while company B supplies the remainder. The additional information has also been made available.

   * 2% of the resistors provided by company A failed the final test,
   * 3% of company B's resistors also fail final test.

   Answer the following questions:

   (i) What is the probability that a resistor fails the final test?

   (ii) What is the probability that a resistor fails the final test given that the resistor in question came from company A?

   (iii) What is the probability that a resistor that fails final test was supplied by company A?

3. The probability distribute of discrete random variable X is tabulated below. There are 5 possible outcome of X, i.e. 1, 2, 4, 6 and 8.

x_i	1	2	4	6	8
$p(x_i)$	0.50	0.15	0.20	0.05	0.10

   (i) Compute the value of k.

   (ii) What is the expected value of X?

   (iii) Compute the value of $E(X^2)$.

   (iv) Given that $E(X^2) = 12.5$, compute the variance of X.

4. The probability distribution of discrete random variable X is tabulated below. There are 5 possible outcomes of X, i.e. 1, 2, 3, 5 ,10 and 20.

x_i	1	2	5	10	20
$P(x_i)$	0.10	0.25	0.30	0.20	0.15

   (i) Determine the expected value $E(X)$.

   (ii) Evaluate $E(X^2)$.

   (iii) Compute the variance of random variable X.