ASSIGNMENT 2

TOTAL MARKS: 100

Submission due date: **2nd May 2021**

QUESTION 1 [10 MARKS]

The probability that indicates the subject will be rated as very easy, P(A) = 0.08, easy, P(B) = 0.29, average, P(C) = 0.34, difficult, P(D) = 0.17 or very difficult, P(E) = 0.12.

Find the probabilities that the subjects will be rated based on the following categories:

a)   Average, easy, or very easy

b)   Average, difficult or very difficult

c)   Neither very difficult nor very easy

d)   Difficult or very easy

QUESTION 2 [15 MARKS]

If A and B are two events and $P(A) = 0.60, P(B) = 0.30$ and $P(A \cup B) = 0.80$, find:

a) $P(A \cap B)$

b) Based on the information given and the answer in (i), complete the following Venn Diagram by labeling the corresponding probability.
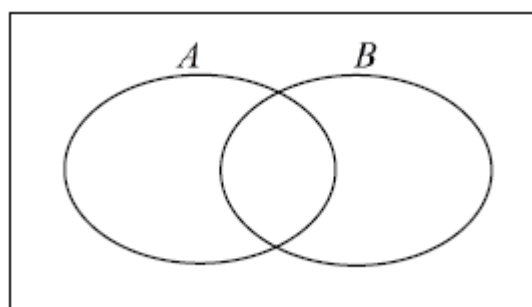
c) $P(A' \cap B)$

d) $P(A' \cap B')$

e) $P(A' \cup B')$

f) $P(A \cap B')$

QUESTION 3 [10 marks]

Airline services provide various packages for their customers booking during holiday season. There are 20%, 45% and 35% of the customers booked for Package A, Package B and Package C respectively. Given, the probability of Package A, Package B and Package C experienced with bad services are 0.002, 0.001 and 0.003.

Based on the above situation, answer the following questions:

a) Construct a tree diagram based on the situation given and determine their associated probabilities, including the intersection probabilities together with the outcomes.

b) Based on the answer in **(i)**, determine the probability that a customer experienced with a good service from the airlines.

c) Given that the package is operating smoothly, what is the probability that it is in Package B?

QUESTION 4 [20 marks]

FarmMilks Sdn. Bhd produce dairy products. 70% of the dairy products sold are banana flavor milk and 30% are kurma flavor milk. The type of dairy product purchased by each of the next 20 customers will be recorded. Given a random variable x as number of dairy product purchased among these 20 customers, answer the following questions:

a) Determine whether x is a binomial random variable or geometry random variable.
b) Calculate the probability that exactly eight dairy product purchased are banana flavor milk.
c) Calculate the probability that between seven and ten (inclusive) are banana flavor milk.
d) Calculate the probability that between three and five (inclusive) are kurma flavor milk.

QUESTION 5 [15 marks]

The probability that a student pilot passes the written test for a private pilot's license is 0.7.

a) Find the probability that a given student will pass the test:

    i.   On the third try

    ii. Before the fourth try

    iii. At the fifth after seventh try

b) What is the mean and variance of the number of trial that the student must take if he/she want to pass with five trial?

QUESTION 6 [15 marks]

At QT Sugar factory the amounts which go into bag of sugar are supposed to be normally distributed with mean 36 kg and standard deviation 0.1 kg. Once every 30 minutes a bag is selected from the production line, and its contents are noted precisely. If the amount of the bag goes below 35.8 kg or above 36.2 kg, then the bag will be declared out of control.

a) If the process is in control, meaning $\mu = 36$ kg and $\sigma = 0.1$ kg, find the probability that the bag will be declared out of control.

b) In the situation of (a), find the probability that the number of bag found out of control in an eight-hour day (16 inspections) will be zero.

c) In the situation of (a), find the probability that the number of bag found out control in an eight-hour day (16 inspections) will be exactly one.

d) If the process shifts so that $\mu = 37$ kg and $\sigma = 0.4$ kg find the probability that a bag will be declared out of control.

QUESTION 7 [15marks]

Great Insurance company has collected the data regarding the duration (how long it takes) to settle insurance claims. The data collected indicate that the duration follows a normal distribution with mean 28 days and standard deviation 8 days.

a) What proportion of the duration is between 20 and 40 days old?

b) What proportion of the duration is less than 30 days old?

c) What is the number of days in which 75% of all claims are above?