UNIVERSITI TEKNOLOGI MARA
FINAL EXAMINATION

COURSE	**:**	**INTRODUCTION TO PROBABILITY AND STATISTICS**
COURSE CODE	**:**	**STA116**
EXAMINATION	**:**	**JULY 2020**
TIME	**:**	**2 HOURS**

INSTRUCTIONS TO CANDIDATES

1. This question paper consists of six (6) questions.
2. Answer ALL questions in the Answer Booklet. Start each answer on a new page.
3. Please check to make sure that this examination pack consists of :
   i) the Question Paper
   ii) A two-page Appendix 1
4. Answer ALL questions in English.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

This examination paper consists of 6 printed pages

QUESTION 1

Aryan is required to complete the assignment given by his lecturer that he has to study the characteristics of a leaf. He picked 50 leaves from different species in a park and the length of each leaf was measured. The data is as follows:

Length (mm)	Number of leaves
20-30	4
30-40	10
40-50	16
50-60	11
60-70	6
70-80	3

a) Construct an ogive for the above data.

(3 marks)

b) From the ogive, estimate the value of median.

(1 mark)

c) Calculate the mean and standard deviation for the length of leaves.

(5 marks)

d) It is found that the value of Pearson Coefficient of Skewness (PCS) is 0.2118, describe the shape of the distribution.

(1 mark)

QUESTION 2

a) In a Statistics test, Hafiz must answer six out of eight questions, of which Part A consists of three questions and Part B consists of five questions. How many ways can Hafiz answer any six questions, without restriction.

(2 marks)

b) It is known that 6.2% of the population in some rural areas suffer from a rare disease. A blood test has a 98% chance of accurately diagnosing the disease for individuals having the disease but has 3% chance of inaccurately indicating that a healthy person has the disease.

i) Draw a tree diagram for the above data.

(3 marks)

ii) Find the probability that a person will have an inaccurate result from the blood test.

(2 marks)

iii) Calculate the probability that a person has the disease, given that the person's blood test is accurate.

(3 marks)

QUESTION 3

The following is the probability distribution of X, the number of imperfections per 10 metres of a synthetic's fabric is given by

X	0	1	2	3	4
$\mathrm{P}(\mathrm{X}=\mathrm{x})$	0.41	0.37	**a**	0.05	0.01

a) Find value **a**.

(2 marks)

b) Find the probability that the number of imperfections is not more than 1.

(2 marks)

c) Find the cumulative distribution function.

(1 mark)

d) Calculate

i) $\mathrm{E}(2\mathrm{X}+2)$.

ii) $\mathrm{V}(4\mathrm{X}-3)$.

(5 marks)

QUESTION 4

a) A factory produces components of which 1% are defective. The components are packed in boxes of 10. A box is selected at random.

i) Find the probability there are more than 8 good components in the box.

(3 marks)

ii) Find the probability that a new batch having 250 components contains between 1 and 4 (inclusive) defective component.

(4 marks)

b) A website receives hits at rate of 300 per hour. Find the probability of at most 15 hits in 2 minutes.

(3 marks)

QUESTION 5

The lifespan of butterflies (in week) is a continuous random variable with the probability density function of

$$f(x) = \begin{cases} k(4 - x^2), & 0 < x < 2 \\ 0, & elsewhere \end{cases}$$

a) Show that $k = \frac{3}{16}$.

(3 marks)

b) Calculate the probability that a butterfly will have lifespan of not more than 1.5 week.

(3 marks)

c) Compute $E(2X - 1)$.

(4 marks)

QUESTION 6

A vending machine is regulated so that it discharges an average of 212 ml per cup. Assume the distribution of amount of drinks in a cup is to be normally distributed with a standard deviation equals to 15 ml.

a) What is the probability of a cup will contain fewer than 220 ml?

(3 marks)

b) Calculate the probability that a cup will contain a minimum of 228 ml.

(3 marks)

c) The probability of the amount of drinks is less than *k* is 0.25, find the value of *k.*

(4 marks)

END OF QUESTION PAPER

