INTI International University & Colleges

FINAL
Examination Paper

(COVER PAGE)

Session	:	**JANUARY 2018**
Programme	:	Diploma in Business (DIB) Diploma in Information and Communication Technology (DICTN)
Course	:	**STA1101: Quantitative Methods**
Date of Examination	:	7 March, 2018 (Wednesday)
Time	:	11:00 am – 1:00 pm Reading Time : Nil
Duration	:	2 Hours

Special Instructions :

Answer any **FOUR (4)** questions.

Materials permitted :

Non-Programmable Calculator

Materials provided :

Formula Booklet 2 and Graph Paper

Examiner(s)	:	**Dr Narinderjit Singh**
Moderator	:	S.M Elizabethrani

*This paper consists of **8** printed pages, including the cover page*

DIPLOMA IN BUSINESS PROGRAMME PROGRAMME (DIB)
DIPLOMA IN MARKETING PROGRAMME (DMKT)
STA 1101: QUANTITATIVE METHODS
FINAL EXAMINATION: JANUARY 2018 SESSION

Instruction: This paper consists of **SIX (6)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

The following data represent the length of life in years, measured to the nearest tenth, of 30 similar fuel pumps:

2.0	3.0	0.3	3.3	1.3	0.4	0.2	6.0	5.5	6.5
0.2	2.3	1.5	4.0	5.9	1.8	4.7	0.7	4.5	0.3
1.5	0.5	2.5	5.0	1.0	6.0	5.6	6.0	1.2	0.2

a) Construct a frequency distribution for these data with class intervals:
0.0 – 0.9, 1.0 – 1.9, 2.0 – 2.9, ... [5 marks]

b) Using the frequency distribution obtained in part (a), compute the sample mean and standard deviation. [6 marks]

c) Construct a histogram for these data and then determine the mode value. [5 marks]

d) Using the histogram obtained in part (c), comment on the distribution of these data? [2 marks]

e) Construct an ogive for these data. [5 marks]

f) Using the ogive obtained in part (e), estimate the median of these data. [2 marks]

Question 2

a) There are three machines M_1, M_2, and M_3. Denote A_1 for the event "machine M_1 works", A_2 for the event "machine M_2 works", and A_3 for the event "machine M_3 works". Consider the following events:

B_1: "exactly one machine works",

B_2: "exactly two machines work", and

B_3: "all the three machines work".

Suppose events A_1, A_2, and A_3 are independent, and $P(A_1) = 0.7$, $P(A_2) = 0.8$, and $P(A_3) = 0.9$.

i. Express the event B_1 in terms of A_1, A_2, and A_3. Calculate $P(B_1)$. [4 marks]

ii. Express the event B_2 in terms of A_1, A_2, and A_3. Find $P(B_2)$. [4 marks]

iii. Express the event B_3 in terms of A_1, A_2, and A_3. Determine $P(B_3)$. [4 marks]

b) Suppose that the thickness X, in millimeters, of a coating process is a random variable with the probability density function

$$f(x) = \begin{cases} 150x(1-5x), & 0 < x < 0.2 \\ 0 & \text{elsewhere.} \end{cases}$$

Determine $E(X)$. [5 marks]

c) A fabric manufacturer claims that at least 40% of orders for raw materials arrive late. If a random sample of 96 orders shows that 33 arrived late, do the data show sufficient evidence to reject his claim? Use the level of significance $\alpha = 5\%$. [8 marks]

Question 3

a) A company that produces fine crystal products knows from experience that 10% of its products are defective.

i. What is the probability that a random sample of 6 products contains exactly one defective item? [3 marks]

ii. Find the probability that a random sample of 6 products contains at least one defective item? [3 marks]

iii. Determine the probability that at least 86 defective products are found in a random sample of 1000 products. [4 marks]

b) Seventy five (75) randomly selected chemistry graduates with doctoral degrees have a mean starting weekly salary of RM 1355 with a standard deviation of RM 216, and 90 randomly selected physics graduates with the doctoral degrees have a mean starting weekly salary of RM 1620 with a standard deviation of RM 241. Do the data suggest, at the 10% level, that there is a significant difference in mean salaries for the chemistry graduates and physics graduates with doctoral degrees? [10 marks]

c) Indicate which one of the following variables are quantitative and qualitative. Hence, classify the quantitative variables as discrete or continuous.

i. The type of songs offered in a karaoke lounge. [1 mark]

ii. The number of children in a Malaysian family. [2 marks]

iii. The time taken to complete a race competition. [2 marks]

Question 4

a) The amounts of a chemical compound, y, that dissolved in 100 grams of water at various temperature, x, were recorded as follows:

x (°C)	0	10	20	30	40	50
y (grams)	6	13	27	41	51	55

i. Plot a scatter diagram of 'dissolved chemical compound' on various 'temperature'. [4 marks]

ii. Determine the least square regression equation that can be used to estimate the amount of chemical compound that will dissolve in 100 grams of water at various temperatures. [5 marks]

iii. What is the strength of correlation that exists between the two variables? Comment on your answer. [3 marks]

iv. Calculate the coefficient of determination of the model and then estimate the mean amount of chemical that will dissolve in 100 grams of water at 45°C. . [3 marks]

b) The heights, in inches, of 20 randomly selected 6-year-old girls are given as below.

44 38 50 47 48 44 42 43 43 45

47 46 40 47 41 46 48 51 41 46

Assume that the heights of 6-year-old girls are normally distributed. Determine

i. a point estimate for the population mean height μ of 6-year-old girls. [2 marks]

ii. the 95% confidence interval for μ. [8 marks]

Question 5

a) Over a long period of time it has been observed that a given marksman can hit a target on a single trial with probability equal to 0.8. Suppose he fires four shots at the target. What is the probability that he will hit the target,

i. exactly twice? [2 marks]

ii. at least once? [3 marks]

b) The average number of traffic accidents on a certain section of highway is two per week. Find the probability of

i. no accidents on this section of highway during a 1-week period. [2 marks]

ii. at most three accidents on this section of highway during a 2-week period. [3 marks]

c) A life insurance company insures the lives of 5000 men aged 42. If actuarial studies show the probability that any 42 year old man will die in a given year to be 0.001, find the probability that the company will have to pay more than 4 claims during a given year. [5 marks]

d) A random sample of n = 25 observations is selected from a population that is normally distributed, with a mean of 106 and standard deviation of 12. Find the probability that the sample mean will exceeds 110. [5 marks]

e) The distribution of the number of cakes, X, bought by a customer at a particular cake shop, is given in the following table:

x	1	2	3	4	5	6
$P(X=x)$	p	$2p$	$4p$	$2p$	$2p$	p

where p is a constant. Find

i. the value of p. [1 mark]

ii. $P(X > 4)$. [2 marks]

iii. the probability of X at most 2. [2 marks]

Question 6

a) A bank has an ATM installed inside the bank and it is available to its customers only from 7 AM to 6 PM Monday through Friday. The manager of the bank wanted to investigate if the percentage of transactions made on this ATM is the same for each of the 5 days (Monday through Friday) of the week. She randomly selected one week and counted the number of transactions made on this ATM on each of the 5 days during this week. The information she obtained is given in the following table, where the number of users represents the number of transactions on this ATM on these days.

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Number of users	253	197	204	279	267

At the 1% level of significance, can we reject the null hypothesis that the number of users who use this ATM each of the 5 days of the week is the same? Assume that this week is typical of all weeks in regard to the use of this ATM.

[11 marks]

b) Define the following terms:

i. population and sample [2 marks]

ii. independent events and mutually exclusive events [2 marks]

c) The prices of three fruits and the number of fruits consumed by a person per week of a town for the years 2011 and 2012 are shown in the following table.

Fruit	Year 2011		Year 2012	
	Price (cents per fruit)	Number of fruits	Price (cents per fruit)	Number of fruits
Apple	0.50	7	0.60	10
Banana	0.20	15	0.35	25
Orange	0.30	9	0.55	12

i. Taking the year 2011 as the base year, calculate the simple aggregate price index for the year 2012. Comment on the changes in the prices of fruits from year 2011 to year 2012.

[4 marks]

ii. Taking the year 2011 as the base year and the number of fruits for the year as the weight, calculate the weighted aggregate price index for the year 2012. Comment on the changes in the prices of fruits from year 2011 to year 2012.

[4 marks]

iii. State one advantage of the weighted aggregate price index over the simple aggregate price index.

[2 marks]

~The End ~