INTI INTERNATIONAL UNIVERSITY

BACHELOR OF COMPUTER SCIENCE (HONS) PROGRAMME
STA2206: QUANTITATIVE METHODS
FINAL EXAMINATION: JANUARY 2017 SESSION

This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

QUESTION 1

(a) A random sample of 60 packages at a courier company was taken and their weights were summarized in the following table.

Weights (kg)	Frequency
5 – 9	7
10 – 14	20
15 – 24	15
25 – 39	10
40 – 44	8

(i) Calculate the sample mean and variance of the above distribution.

(7 marks)

(ii) Plot an ogive for the distribution and estimate the median.

(4 marks)

(iii) From the graph constructed in part (ii) estimate the percentage of packages which are at least 20 kg?

(3 marks)

(iv) Form a 95% confidence interval for the mean weight of all packages of the courier company.

(5 marks)

(b) In a recent survey of 1600 upscale households in five large metropolitan areas, 24% of men consider themselves the primary shoppers for their household's groceries and their own clothing (Assume that each household contains one woman and one man). Although the men in the survey are highly computer-literate (87% have home computers), only 22% of the men say that computerized shopping is satisfying.

(i) Find a 90% confidence interval for the percentage of men who consider themselves the primary shoppers for their household's groceries and their own clothing.

(4 marks)

(ii) Find the 95% margin of error in estimating the proportion of men who find computerized shopping satisfying.

(2 marks)

QUESTION 2

(a) A television cable company receives numerous phone calls throughout the day from customers reporting service troubles and from would-be subscribers to the cable network. Most of these callers are put "on hold" until a company operator is free to help them. The company has determined that the length of time a caller is on hold is normally distributed with a mean of 3.1 minutes and a standard deviation 0.9 minutes. Company experts have decided that if as many as 5% of the callers are put on hold for 4.8 minutes or longer, more operators should be hired.

(i) What proportion of the company's callers are put on hold for more than 4.8 minutes?

(4 marks)

(ii) At another cable company (length of time a caller is on hold follows the same distribution as before) 2.5% of the callers are put on hold for longer than x minutes. Find the value of x.

(4 marks)

(b) At a grocery store customers were surveyed on their shopping habits. The results revealed that 25% use coupons, 43% bring their own bags, and 12% do both.

(i) What is the probability that a randomly chosen shopper uses coupon given that he brings a bag .

(4 marks)

(ii) What is the probability that a randomly chosen shopper brings a bag given that he doesn't use coupon.

(3 marks)

(iii) Are the two events ,using coupons and bringing a bag independent?

(2 marks)

(c) ABC Corporation gives each of its employees an aptitude test. The scores on the test are normally distributed with a mean of 75 and a standard deviation of 15. A simple random sample of 25 is taken from a population of 500.

(i) What is the probability that the average aptitude test score in the sample will be between 70.14 and 82.14?

(4 marks)

(ii) Find a value, C, such that P($\overline{X} \geq$ C) = 0.015.

(4 marks)

QUESTION 3

(a) Each Sunday a fisherman visits one of three possible locations near his home: he goes to the sea with probability $\frac{1}{2}$, to a river with probability $\frac{1}{4}$, or to a lake with probability $\frac{1}{4}$. If he goes to the sea, there is an 80% chance that he will catch fish; corresponding figures for the river and the lake are 40% and 60% respectively.

(i) Find the probability that, on a given Sunday, he catches fish.

(3 marks)

(ii) If, on a particular Sunday, he comes home without catching anything, where is it most likely that he has been?

(4 marks)

(b) A quality assurance manager wants to determine *P*, the population proportion of printers that need minor adjustments at initial startup. A random check on a batch of printers revealed that 20% of them need minor adjustments. The reported 95% confidence interval for the population proportion was 0.036 to 0.264. What sample size was used to compute the confidence interval.

(5 marks)

(c) Is the type of beverage ordered with lunch at a restaurant independent of the age of the consumer? A random poll of 309 lunch customers is taken, resulting in the following contingency table of observed values. Use a = .01 to determine whether the two variables are independent.

Age	Preferred Beverages		
	Coffee/Tea	Soft drinks	Others
21 – 34	26	95	19
35 – 55	40	40	20
>55	24	15	31

Use 5% significance level to determine whether the two variables are independent.

(10 marks)

(d) Suppose that we wanted to estimate the true average number of eggs a queen bee lays with 95% confidence. The margin of error we are willing to accept is 0.5. Suppose we also know that the standard deviation is 10. What sample size should we use?

(3 marks)

QUESTION 4

(a) Suppose that during any hour in a large department store, the average number of shoppers is 448, with a standard deviation of 21 shoppers. What is the probability that a random sample of 49 different shopping hours will yield a sample mean between 441 and 446 shoppers.

(4 marks)

(b) The following percentages come from a national survey of the ages of prerecorded music shoppers. A local survey produced the observed values.

Age	10-14	15-19	20-24	25-29	30-34	≥ 35
Percentage	9	23	22	14	10	22
Frequency	22	50	43	29	19	49

Does the evidence in the observed data indicate that we should reject the national survey distribution for local prerecorded-music shoppers? Use 1% significance level.

(10 marks)

(c) A random sample of 8 steel bars was taken from a warehouse and the elongation measured in percentage is determined. The table below gives the observed values.

39 41 35 33 35 39 29 37

(i) Form a 99% confidence interval for the average elongation measured in percentage .

(6 marks)

(ii) Test at 5% significance level, whether the average elongation measured in percentage is different from 40.

(5 marks)

QUESTION 5

(a) In Cheap town the monthly food expenses of a typical family were the following:

Product measurement	2014		2017	
	Quantity	Price	Quantity	Price
Bread (kg)	18	94	25	110
Milk (litre)	32	86	44	130
Fish(Kg)	300	74	880	81

Using 2014 as the base year , for the year 2015, construct

(i) a simple aggregate price index.

(3 marks)

(ii) a weighted aggregate price index using the current-period weight. Name the indexing method you used. Comment on the result.

(4 marks)

(b) A specialist in hospital administration stated that the number of full-time employees in a hospital can be estimated by counting the number of beds in the hospital. A healthcare business researcher decided to develop a regression model in an attempt to predict number full-time employees of a hospital by the number of beds. She surveyed seven hospitals and obtained the following data. The data are presented in sequence, according to the number of beds.

Number of Beds	23	76	42	29	50	29	35
Full-time employees	69	176	126	95	138	102	118

(i) Plot a scatter diagram that shows the relationship between number of full-time employees in a hospital and the number of beds in the hospital.

(4 marks)

(ii) Find the correlation coefficient and interpret its value.

(5 marks)

(iii) Use the equation of the linear regression line for the number of full-time employees in the hospital and the number of beds in the hospital to estimate the number of full-time employees in a 60 bedded hospital. Is your estimation reliable ?

(6 marks)

(iv) Find the coefficient of determination of the linear model and comment on its value.

(3 marks)

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