INTI
International College Subang
LAUREATE INTERNATIONAL UNIVERSITIES'

FINAL
Examination Paper

(COVER PAGE)

Session	:	**April 2015**
Programme	:	Diploma In Information And Communication Technology **(DICTN)**
Course	:	**STA1101: QUANTITATIVE METHODS**
Date of Examination	:	August 5, 2015
Time	:	5:00pm – 7:00pm Reading Time: Nil
Duration	:	2 Hours
Special Instructions	:	

Answer any **FOUR (4)** structured-type questions.

Materials permitted :

Non-programmable Calculator

Materials provided :

Formula Booklet 2 and Graph paper

Examiner (s)	:	**Ms. S.M. Elizabethrani,** Bark Chee Beng
Moderator	:	Dr. Ng Set Foong

This paper consists of 7 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE SUBANG

DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY (DICTN)
STA1101 : QUANTITATIVE METHODS
FINAL EXAMINATION : APRIL 2015 SESSION

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

Question 1

(a) The following frequency distribution shows the grades on the first examination in operating management.

Examination Grade	Frequency
40 – 49	3
50 – 59	5
60 – 69	11
70 – 79	22
80 – 89	15
90 – 99	14

(i) Develop a cumulative frequency distribution and portray the distribution in an ogive (*use graph paper*). From the ogive, estimate the median grade. (7 marks)

(ii) Calculate the mean. (3 marks)

(iii) Calculate the mode. (3 marks)

(iv) Treating those data as sample, compute the standard deviation. (4 marks)

(v) Find the variance. (1 mark)

(vi) Calculate the Pearson's measure of skewness and comment on the distribution. (3 marks)

(b) The diagram below shows promotion status of police officers over the past two years.

	Men	Women
Promoted	288	40
Not Promoted	612	260

(i) What is the probability that a randomly selected office is a man and is promoted? (2 marks)

(ii) What is the probability that an officer is promoted given that the officer is a man? (2 marks)

Question 2

(a) The following table shows the probability distribution of a discrete random variable X.

x	0	1	2	4	8
$P(X=x)$	$\frac{1}{16}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$

(i) Compute E(X). (2 marks)

(ii) Compute Var (X) (3 marks)

(b) If 6.5% of households in a small town participate in recycling, and if 2000 households are selected at random from this small town, find the

(i) expected number of households that recycle. (2 marks)

(ii) standard deviation of this distribution. (3 marks)

(c) The demand for a new product is assumed to be normally distributed with a mean of 200 units and a standard deviation of 40 units. What is the probability that

(i) the demand is more that 250 units? (3 marks)

(ii) the demand is between 180 and 230 units? (4 marks)

(d) A recent study of 50 self-service gasoline stations in City-Center revealed that the mean price of unleaded gas was \$1.52 per gallon. The sample standard deviation was \$0.03 per gallon. Determine a 99% confidence interval for the population mean price.

(4 marks)

(e) Two events C and D are independent where P(C) = 0.45 and P(D) = 0.35.

(i) Find $P(C \cap D)$. (2 marks)

(ii) Find $P(C/D)$. (2 marks)

Question 3

(a) A bowler's score for six games were 182, 168, 184, 190, 170, and 174. Using these data as a sample compute the following descriptive statistics.

(i) Range (1 mark)

(ii) Variance (4 marks)

(b) A machine is set to fill a small bottle with 9.0 grams of medicine. A sample of eight bottles revealed the following amounts (grams) in each bottle.

9.2 8.7 8.9 8.6 8.8 8.5 8.7 9.0

At the 0.01 significance level, can we conclude that the mean weight is less than 9.0 grams? (10 marks)

(c) A survey is conducted at random to determine eye and hair color in a population.

Hair Color	Blue Eyes	Brown Eyes	Total
Blond	10	30	40
Black	40	100	140
Red	5	25	30
	55	155	210

Test the hypothesis at the 0.01 level that hair color is independent of eye color for this population. (10 marks)

Question 4

(a) Kent David trains employees to use a specific statistical software package. A random sample of seven trainees have turned in the following performances in recent weeks:

Hours of Training	1	4	6	8	2	3	1
Error	6	3	2	1	5	4	7

Let x be the hours of training and y be the number of errors, the summary statistics are given as $\sum xy = 67$, $\sum x^2 = 131$, $\sum y^2 = 140$, $\sum x = 25$ and $\sum y = 28$.

(i) Draw a scatter diagram for the data pairs above and state the relationship that exists between the variables. (4 marks)

(ii) Find the y intercept, a, and slope of the regression line, b. (4 marks)

(iii) Write the equation for the line of regression. (1 mark)

(iv) Predict the number of errors for a person with 5 hours of training. (2 marks)

(b) The Nic Wire Company makes wires for electronic firms. The population mean thickness for the wires is 0.45 inch and the population standard deviation is 0.03 inch. A sample of 80 pieces of wire is selected randomly and the thickness of each sample member is measured:

(i) What is the mean and standard deviation of the sampling distribution? (3 marks)

(ii) What is the probability that the mean of the sample of the 100 pieces of wire exceeds 0.455 inch? (3 marks)

(c) The following table shows farm prices (per carton) and quantities produced (in billions of cartons) of 3 kind of grain produced during the years 1999 and 1989.

	Price per carton		Quantity of cartons (in billion)	
	1988	1989	1988	1989
Corn	2.75	2.55	6.9	9.5
Wheat	4.52	4.62	2.0	2.2
Oats	2.82	1.68	0.4	0.6

(i) Find the base-weighted price index for the grains produced in 1989 by taking 1988 as the base year. (4 marks)

(ii) Calculate the current-weighted price index for the grains produced in 1989 by taking 1988 as the base year. (4 marks)

Question 5

(a) A college football coach was interested in whether the college's strength development class increased his players' maximum lift (in pounds) on the bench press exercise. He asked 4 of his players to participate in a study. The amount of weight they could each lift was recorded before they took the strength development class. After completing the class, the amount of weight they could each lift was again measured. The data are as follows:

Weight (in pounds)	**Player 1**	**Player 2**	**Player 3**	**Player 4**
Amount of weighted lifted prior to the class	205	241	338	368
Amount of weight lifted after the class	295	252	330	360

The coach wants to know if the strength development class makes his players stronger, on average. Test at the 5% significance level.

(10 marks)

(b) Past experience at the RR Travel Agency indicated that 44 % of those persons who wanted the agency to plan a vacation for them wanted to go to Europe. During the most recent busy season, a sampling of 1000 plans was selected at random from the files. It was found that 480 persons wanted to go to Europe on vacation. Has there been a significant shift upward in the percentage of persons who want to go to Europe? Test at the 0.05 significance level.

(7 marks)

(c) Mrs. Dory is concerned about absenteeism among the workers in her bakery. She collected information on the numbers of days absent for a sample of 10 workers during the last two week pay period. She found the mean and standard deviation of the sample are 1.8 and 1.1353 respectively.

(i) Develop a 95 percent confidence interval for the population mean. (4 marks)

(ii) Explain why the t distribution is uses as a part of the confidence interval. (2 marks)

(iii) How could you increase the width of a confidence interval of a population mean? (2 marks)

Question 6

(a) A local journal of Public Health has reported that in 1990, 10% of nursing home residents were younger than 65, 13% of these residents were at least 65 but less than 75, 32% were at least 75 but less than 84, and 45% were 84 and older. The following data are from a recent random sample of 6629 nursing home residents:

Age	Current Number
Younger than 65	398
atleast 65 and less than 75	663
atleast 75 and less than 84	2,254
84 and over	3,314

At the 0.05 significance level, has the age distribution of all nursing home residents changed since 1987? (10 marks)

(b) In comparing purchases from 2 companies, a sample of 16 purchases from Cambells with the mean \$ 11, 045 and standard deviation of \$ 835 is taken. For a sample of 18 purchases from Rainer , the mean cost is \$ 12,840 and standard deviation is \$ 1545.
At the 5% significance level, can we conclude that the cost from Rainer is higher? (8 marks)

(c) Ms Alice is a loan officer at a local bank. From her years of experience, she estimates that the probability is 0.025 that an applicant will not be able to repay his or her installment loan. Last month she made 40 loans.

(i) What is the probability that 3 loans will be defaulted? (3 marks)

(ii) What is the probability that at least 3 loans will be defaulted? (4 marks)

- The End –

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BUSINESS STATISTICS

Descriptive Statistics

	UNGROUPED	GROUPED
Population variance	$\dfrac{\sum x^2 - \dfrac{(\sum x)^2}{N}}{N}$	$\dfrac{\sum fm^2 - \dfrac{(\sum fm)^2}{\sum f}}{\sum f}$
Sample variance	$\dfrac{\sum x^2 - \dfrac{(\sum x)^2}{n}}{n-1}$	$\dfrac{\sum fm^2 - \dfrac{(\sum fm)^2}{\sum f}}{\sum f - 1}$

Binomial Distribution

$P(X = x) = {}^nC_x p^x q^{n-x}$

Poisson Distribution

$p(x;\mu) = \dfrac{e^{-\mu}\mu^x}{x!}$

Sampling Distributions of Mean

$\sigma_{\overline{X}} = \dfrac{\sigma}{\sqrt{n}}$ when population variance is known.

$\sigma_{\overline{X}} = \dfrac{s}{\sqrt{n}}$ when population variance is unknown.

The z value of a value of $\overline{X}$ is calculated as : $Z = \dfrac{\overline{X} - \mu}{\sigma_{\overline{X}}}$

Sampling Distributions of Proportion

$\sigma_p = \sqrt{\dfrac{\pi(1-\pi)}{n}}$

The z value for a value of p is calculated as : $Z = \dfrac{p - \pi}{\sigma_p}$

(1-α)100% CONFIDENCE INTERVAL FOR μ

$\overline{X} \pm Z_{\alpha/2}\dfrac{\sigma}{\sqrt{n}}$ if population variance is known.

$\overline{X} \pm Z_{\alpha/2}\dfrac{s}{\sqrt{n}}$ if population variance is unknown and $n \geq 30$.

$\overline{X} \pm t_{\alpha/2}\dfrac{s}{\sqrt{n}}$ if population variance is unknown and $n < 30$.

Hypothesis Testing

When population variance is known, $z = \dfrac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

When population variance is unknown and $n \geq 30$, $z = \dfrac{\bar{x} - \mu}{s / \sqrt{n}}$

When population variance is unknown and $n < 30$, $t = \dfrac{\bar{x} - \mu}{s / \sqrt{n}}$

For Proportion $z = \dfrac{\hat{p} - p}{\sqrt{\dfrac{pq}{n}}}$

Testing the Difference between Two Means, and Two Proportions

Comparing two means (large independent samples):

$$z = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}}$$

Comparing two means (small independent samples, variances equal):

$$t = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}\sqrt{\dfrac{1}{n_1} + \dfrac{1}{n_2}}}$$

Comparing two means for small dependent samples

$$t = \frac{\overline{D} - \mu_D}{s_D / \sqrt{n}} \quad \text{where} \quad \overline{D} = \frac{\Sigma D}{n} \quad \text{and} \quad s_D = \sqrt{\frac{\Sigma D^2 - \dfrac{(\Sigma D)^2}{n}}{n-1}}$$

Correlation and Regression

Correlation Coefficient :

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\Sigma x^2) - (\Sigma x)^2][n(\Sigma y^2) - (\Sigma y)^2]}}$$

The regression line equation: $y' = a + bx$

Where $a = \dfrac{(\Sigma y)(\Sigma x^2) - (\Sigma x)(\Sigma xy)}{n(\Sigma x^2) - (\Sigma x)^2}$ $\quad b = \dfrac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x)^2}$

Chi-Square and Analysis of Variance

Chi-square test for goodness of fit:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Chi-square test for independence and homogeneity of proportions:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$