



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2015/2016**

COURSE NAME : STATISTICS
COURSE CODE : BIT 11603
PROGRAMME CODE : BIT
EXAMINATION DATE : JUNE / JULY 2016
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

- Q1 (a) The Federal Trade Commission of Malaysia measured the number of milligrams of tar and carbon monoxide (CO) per cigarette for all domestic cigarettes. Let x and y denote the measurements of tar and CO respectively, for 100-millimeter filtered and mentholated cigarettes. A sample of 12 brands yielded the following data in **Table 1**.

Table 1: The number of milligrams of tar and CO from 12 brands yielded

x	9	4	14	12	10	5
y	6	6	14	12	12	7
x	3	17	6	7	8	15
y	4	18	8	8	13	13

- (i) Find the mean, variance, and standard deviation for each of the measurements of tar and CO.
(6 marks)
- (ii) Show the histograms for both measurements.
(4 marks)
- (b) Let X be a continuous random variable with the function below,

$$f(x) = \begin{cases} 12(x^2 - x^3), & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$

- (i) Show that $f(x)$ satisfy with the probability density function.
(5 marks)
- (ii) Find the mean and variance of X .
(5 marks)

Q2 (a) A system consists of seven databases that to be accessed by user's transaction. A transaction can successfully update databases when the transaction obtain majority locked from those databases. Assume that the probability of obtaining lock from each database is, $p = 0.7$. Find the probability of a transaction that can successfully update databases from the system.

(10 marks)

(b) A server on average has to do five read-locks per hour. For any given hour, find the probability that will do the following:

(i) At most five read-locks.

(5 marks)

(ii) At least six read-locks.

(5 marks)

Q3 Suppose we want to purchase a used three-years-old Proton Gen 2. We would like to estimate the population mean price of a used three-years-old Proton Gen 2. We estimate the population mean by obtaining a random sample of 15 used three-year-old Proton Gen 2 listed in **Table 2**.

Table 2: The market price of 15 used three-year-old Proton Gen 2

RM35 000	RM43 108	RM33 995	RM32 750	RM33 998
RM43 500	RM33 995	RM32 750	RM39 950	RM36 900
RM35 995	RM39 998	RM37 995	RM37 995	RM43 785

(a) Calculate the point estimate of the population mean (μ) and the Margin of Error (ME).

(6 marks)

(b) Construct a 90% and 95% confidence interval about the population mean (μ).

(6 marks)

(c) Based on answers from **Q3(b)**, is the width of 95% confidence interval larger than the width of 90% confidence interval? Explain your answer.

(3 marks)

(d) Construct a 90% confidence interval for $n = 45$.
(2 marks)

(e) Comparing your answers from **Q3(b)** and **Q3(d)**, how does the sample size, n , affect the confidence interval?
(3 marks)

Q4 (a) Make the following test of hypothesis.

(i) $H_0 : \mu = 83, H_1 : \mu \neq 83, n = 35, \bar{x} = 80.5, \sigma = 15, \alpha = 0.10$.
(5 marks)

(ii) $H_0 : \mu = 42, H_1 : \mu < 42, n = 75, \bar{x} = 40.5, \sigma = 7.4, \alpha = 0.01$.
(5 marks)

(b) Random sample 8 observations, 11.0, 10.7, 9.4, 7.8, 11.3, 9.1, 10.2, 10.5 are taken to determine if there is evidence that the concentration of an average certain material less than 11ppm. Test the claim by using $\alpha = 0.025$.
(10 marks)

Q5 A sample of seven household income from a small town and collect information of their incomes and food expenditure for the last month. The information obtained is given in **Table 3** (both in hundreds of Ringgit Malaysia).

Table 3: Income, food and utility expenditure of seven household

Income (RM)	55	83	38	61	33	49	67
Food & Utility Expenditure (RM)	14	24	13	16	9	15	17

(a) Based on the data in **Table 3**, obtain the least squares line of the food and utility expenditure on the household income. Use income as an independent variable.
(6 marks)

(b) Predict the food and utility expenditure if we randomly select a monthly income is RM 6,100 and calculate the error of prediction.
(4 marks)

- (c) Test at 1% significance level whether the slope of the regression line for the incomes and food utility expenditures of seven households is positive.
(6 marks)
- (d) Calculate the coefficient of determination (R^2) and comment on your answer.
(4 marks)

- END OF QUESTION -

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Formula

$$S_{xy} = \sum x_i y_i - \frac{\sum x_i \sum y_i}{n}, S_{xx} = \sum x_i^2 - \frac{(\sum x_i)^2}{n}, S_{yy} = \sum y_i^2 - \frac{(\sum y_i)^2}{n},$$

$$r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}}, \hat{\beta}_1 = \frac{S_{xy}}{S_{xx}}, \hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x}$$

$$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}, Z = \frac{\bar{x} - \mu}{s/\sqrt{n}}, T = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

$$\bar{x} - z_{\alpha/2} \left(\frac{\sigma}{\sqrt{n}} \right) < \mu < \bar{x} + z_{\alpha/2} \left(\frac{\sigma}{\sqrt{n}} \right)$$

$$\bar{x} - z_{\alpha/2} \left(\frac{s}{\sqrt{n}} \right) < \mu < \bar{x} + z_{\alpha/2} \left(\frac{s}{\sqrt{n}} \right)$$

$$\bar{x} - t_{\alpha/2, v} \left(\frac{s}{\sqrt{n}} \right) < \mu < \bar{x} + t_{\alpha/2, v} \left(\frac{s}{\sqrt{n}} \right), v = n - 1$$

$$S_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2} \text{ and } v = n_1 + n_2 - 2, v = 2(n - 1)$$

$$\chi^2 = \sum_{i=1}^k \frac{(O_i - E_i)^2}{E_i}, \chi^2 = \sum_{i=1}^r \sum_{j=1}^c \frac{(O_{ij} - E_{ij})^2}{E_{ij}}, MSTR = \frac{SSTR}{k-1}, MSE = \frac{MSTR}{N-k}$$

$$SST = \sum X^2 - (\sum X)^2/N, SSTR = \sum T_i^2/n_i - (\sum X)^2/N, SSE = SST - SSTR$$

$$T = \frac{\hat{\beta}_1 - \beta_c}{\sqrt{MSE/S_{xx}}}, SSE = S_{yy} - \hat{\beta}_1 S_{xy}, MSE = \frac{SSE}{n-k}$$

$$\chi^2 = \frac{(n-1) \cdot s^2}{\sigma^2_0}, F = \frac{s_1^2}{s_2^2}$$

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$$v = \frac{(s_1^2/n_1 + s_2^2/n_2)^2}{\frac{(s_1^2/n_1)^2}{n_1 - 1} + \frac{(s_2^2/n_2)^2}{n_2 - 1}}$$

$$\sum_{i=-\infty}^{\infty} p(x_i) = 1, E(X) = \sum_{\forall x} xp(x), \text{Var}(X) = E(X^2) - [E(X)]^2,$$

$$P(X = r) = {}^n C_r \cdot p^r \cdot (1-p)^{n-r} \quad r = 0, 1, \dots, n \quad P(X = r) = \frac{e^{-\mu} \cdot \mu^r}{r!} \quad r = 0, 1, \dots, \infty$$

$$X \sim N(\mu, \sigma^2), Z \sim N(0, 1) \text{ and } Z = \frac{X - \mu}{\sigma},$$

$$\bar{X} \sim N\left(\mu, \frac{\sigma^2}{n}\right), Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} \sim N(0, 1), \bar{X}_1 - \bar{X}_2 \sim N\left(\mu_1 - \mu_2, \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right)$$