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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017**

COURSE NAME : BUSINESS STATISTICS
COURSE CODE : BWB 20903
PROGRAMME CODE : BWQ
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DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

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- Q1**
- (a) Farid plans to construct a confidence interval for the mean of a normal population with known standard deviation. List **THREE (3)** factors that could assist him in reducing the size of the margin error. (3 marks)
- (b) Rosli collected a random sample of size, n and then he computed a 95% confidence interval for the mean of the population. State **ONE (1)** factor could produce a new confidence interval with a larger width (larger margin of error) based on the same data. (1 mark)
- (c) An efficiency expert wishes to determine the average time that it takes to drill three holes in a certain metal clamp. Calculate the sample will he needs to be 95% confidence that his sample mean will be within 15 seconds of the true mean. Assume that it is known from previous studies that $E = 40$ seconds. (5 marks)
- (d) A new rocket-launching system was being considered for deployment of small, short-range rockets. The existing system has $p = 0.8$ as the probability of a successful launch. A sample of 40 experimental launches were made with the new system and 34 were successful.
- (i) Construct a 95% confidence interval for p . (8 marks)
- (ii) Would you conclude that the new system is better? (1 mark)
- (e) A random sample of 30 firms dealing in wireless products were selected to determine the proportion of such firms that have implemented new software to improve productivity. It turned out that eight of the 30 have implemented such software.
- (i) Find a 95% confidence interval on p , the true proportion of such firms that have implemented new software. (4 marks)
- (ii) Suppose there is concern about whether or not the point estimate of $p = 8/30$ is accurate enough because the confidence interval around p is not sufficiently narrow. Using p value as your estimate of \hat{p} , how many companies would need to be sampled in order to have a 95% confidence interval with a width of only 0.05? (3 marks)

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- Q2** (a) Sepang General Hospital's patient account division has compiled data on the age of accounts receivables. The data collected indicate that the age of the accounts follows a normal distribution with mean of 28 days and standard deviation of eight days.
- (i) Compute the proportion of the accounts are between 20 and 40 days old. (6 marks)
- (ii) Calculate the proportion of the accounts is less than 30 days old. (4 marks)
- (b) The length of time of long-distance telephone calls has mean of 18 minutes and standard deviation of four minutes. Suppose a sample of 50 telephone calls is used to reflect on the population of all long-distance calls.
- (i) Compute the probability that the average of the 50 calls is between 16 and 17 minutes. (6 marks)
- (ii) State the theorem we applied in **Q2(b)(i)**. (1 mark)
- (c) An Insurance Company MAA states that 10% of all fire insurance claims are fraudulent. Suppose the company is correct, and that it receives 125 claims.
- (i) Calculate the probability that at least 15 claims are fraudulent. (5 marks)
- (ii) Find the probability that less than 10 claims are fraudulent. (3 marks)

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- Q3** (a) It is desired to estimate the population mean to within 50 units with 90% reliability. The population standard deviation is estimated to be 250 units. How many sample size should be selected? (5 marks)
- (b) Husna wish to perform the hypothesis testing $H_0 : \mu = 1$ versus $H_1 : \mu < 1$ with $\alpha = 0.10$. The sample size of 25 was obtained independently from a population with standard deviation of 10.
- (i) Write the distribution of the sample mean given that the null hypothesis is true. (2 marks)
- (ii) Give the critical value. (1 mark)
- (iii) Calculate the values of sample mean if she reject the null hypothesis. (2 marks)
- (iv) Given that the sample mean is -2, calculate the *p-value*. (3 marks)
- (c) An investigation on the effect of household waste of a recycling campaign in Sedenak found that the weekly amounts of waster produced each of 26 similar households recorded before and after the campaign. Assume that changes in the amount of waste produced by households can be modeled as independent and identically distributed random variables with a Normal distribution and expectation, θ . The mean change in the amount of waste produced by the 26 households was -3.41 kg and the standard deviation of the changes was 9.03 kg.
- (i) Construct suitable test of left side 5% for the null hypothesis, $H_0 : \theta = 0$ versus alternative hypothesis $H_1 : \theta < 0$. (6 marks)
- (ii) Calculate the value of θ , if the power of the test equal to 90%. (6 marks)

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Q4 A researcher was using data for a sample of 274 male employees to investigate the relationship between hourly wage rates, y_i (measured in Ringgit Malaysia per hour) and firm tenure, x_i (measured in years). Preliminary analysis of the sample data produces the following sample information:

$$n = 274, \sum_{i=1}^n Y_i = 1945.26, \sum_{i=1}^n X_i = 1774.00, \sum_{i=1}^n Y_i^2 = 18536.73,$$

$$\sum_{i=1}^n X_i^2 = 30608.00, \sum_{i=1}^n X_i Y_i = 16040.72, \sum_{i=1}^n x_i y_i = 3446.226,$$

$$\sum_{i=1}^n y_i^2 = 4726.377, \sum_{i=1}^n x_i^2 = 19122.32, \sum_{i=1}^n \hat{\mu}_i^2 = 4105.297$$

where $x_i = X_i - \bar{X}$ and $y_i = Y_i - \bar{Y}$ for $i = 1, \dots, n$.

- (a) Calculate the Ordinary Least Squares (OLS) estimates of the intercept and the slope coefficients. (7 marks)
- (b) Interpret the slope coefficient estimated in **Q4(a)**. (3 marks)
- (c) Find the estimated of error variance. (5 marks)
- (d) Compute the estimated variance of slope coefficient. (4 marks)
- (e) Find the coefficient of determination for the sample regression equation. Briefly explain the value means. (6 marks)

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- END OF QUESTIONS -