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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2014/2015**

COURSE NAME : BUSINESS STATISTICS  
COURSE CODE : BWB 20903  
PROGRAMME : 2 BWQ  
EXAMINATION DATE : JUNE 2015/JULY 2015  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER ALL FIVE QUESTIONS

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

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- Q1**
- (a) Regression analysis is the generic term for several statistical tests for evaluating the relationship between interval level (i) and (ii) variables. In considering both variables, we use (iii). However, if we considering the relationship between one dependent variable and more than one explanatory variables, we should use (iv). (4 marks)
- (b) List down three purposes of using the Simple Linear Regression. (3 marks)
- (c) How to prove the existence of a relationship between the variables in the Simple Linear Regression ? (1 mark)
- (d) How we should measure the strength of the relationship in the Simple Linear Regression ? Please state two answers. (2 marks)
- (e) How we able to state the direction of the relationship in the Simple Linear Regression ? (1 mark)
- (f) Most supermarkets use scanners at the checkout counters. The data collected this way can be used to evaluate the effect of price and store's promotional activities on the sales of any product. The promotions at a store change weekly, and are mainly of two types; flyers distributed outside the store and through newspapers (which may or may not include that particular product), and in-store displays at the end of an aisle that call the customers' attention to the product. Weekly data was collected on a particular beverage brand, including sales (in number of units), price (in Ringgit Malaysia), flyer (1 if product appeared that week, 0 if it didn't) and display (1 if a special display of the product was used that week, 0 if it wasn't). As a preliminary analysis, a Simple Linear Regression model was done. The fitted regression equation was :  $sales = 2259 - 1418price$  . The ANOVA F-test p-value was 0.000 and  $R^2 = 59.7\%$  .
- (i) What is the response variable ? (1 mark)
- (ii) What is the best interpretation of the slope of the line ? (2 marks)
- (iii) Should the intercept of the line be interpret in this case ? Why ? (2 marks)

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- (iv) What is the proportion of the variability in sales accounted by the price of the product ?  
(1 mark)
- (v) According to this model, how many units will be sold, on average, when the price of the beverage is RM1.10 ?  
(2 marks)
- (vi) Why is a price as good predictor of sales ?  
(1 mark)

- Q2**
- (a)
    - (i) What is the basic definition of  $p$ -value ?  
(1 mark)
    - (ii) State when a *Type I* error is committed.  
(1 mark)
    - (iii) State when a *Type II* error is committed.  
(1 mark)
    - (iv) What is the meaning of a hypothesis test if they has a Type I error probability ( $\alpha$ ) of 0.01 ?  
(1 mark)
    - (v) A researcher is testing a hypothesis of a single mean. The critical  $z$ -value for  $\alpha = 0.05$  and two-tailed test is 1.96. The observed statistic test value from sample data is -1.85. What is the decision should researcher decide based on this information ?  
(1 mark)
    - (vi) In a two-tailed hypothesis about a population mean with a sample size of 100 and  $\alpha = 0.05$ , what is the rejection region should be ?  
(2 marks)

- (b) Farah's housemate Mariya is trying to convince Farah to get piercing. But, Farah is very sensitive to popular opinion, however and will only get one if "everyone else is doing it". Of course, everyone is unrealistic, so Farah will settle on getting the piercing if Mariya can show that more than 60% of people in UNIMAS have one. Mariya wastes no time in taking a sample of 60 students from College Aman and performing the appropriate hypothesis test. Her sample revealed 44 students who admitted to have a piercing.

(i) Test the hypothesis either Farah will end up getting a piercing at  $\alpha = 0.05$ . (9 marks)

(ii) Do you have any criticisms on Mariya's sample ? (1 mark)

(c) A French teacher grouped her high school students into three groups. One who had never studied a foreign language before but had good English skills, one who had never studied a foreign language and had poor English skills, and one who had studied at least one foreign language. She then compared the first quiz scores of the three groups. The ANOVA result is shown in the **Table Q2(c)**.

**Table Q2(c) : ANOVA Result**

	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	p-value
Between variation	30			2.500	0.1768
Within variation	30				
Total	60				

(i) State the degrees of freedom for the between variation ? (1 mark)

(ii) What is the hypothesis did the French teacher set up ? (2 marks)

**Q3** (a) Amin is going to construct a confidence interval for the mean of a normal population with known standard deviation. List three factors that could help him reduce the size of the margin of error. (3 marks)

(b) Ali collect a random sample of size  $n$  from a population and from the data collected compute a 95% confidence interval for the mean of the population. What is the factor would produce a new confidence interval with larger width (larger margin of error) based on these 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. How large a sample will he needs to be 95% confidence that his sample mean will be within fifteen

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seconds of the true mean ? Assume that it is known from previous studies that  $E = 40$  seconds.

(3 marks)

- (d) A new rocket-launching system is 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 forty experimental launches is made with the new system and thirty four are successful.

(i) Construct a 95% confidence interval for  $p$ .

(5 marks)

(ii) Would you conclude that the new system is better ?

(1 mark)

- (e) A random sample of thirty 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 thirty 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  $p$  as your estimate of  $p$ , 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)

- Q4 (a) Bradford 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 twenty eight days and standard deviation eight days.

(i) What is the proportion of the accounts are between twenty and forty days old ?

(4 marks)

(ii) What is the proportion of the accounts are less than thirty days old ?

(3 marks)

(iii) What is the number of days in which 75% of all accounts are above ?

(2 marks)

(b) The length of time of long-distance telephone calls has mean of eighteen minutes and standard deviation of four minutes. Suppose a sample of fifty telephone calls is used to reflect on the population of all long-distance calls.

(i) What is the chance that the average of the fifty calls is between sixteen and seventeen minutes ?

(4 marks)

(ii) State the theorem we need to use in order to solve Q4(b)(i).

(1 mark)

(c) An Insurance Company OUB states that 10% of all fire insurance claims are fraudulent. Suppose the company is correct, and that it receives 125 claims.

(i) What is the probability that at least fifteen claims are fraudulent ?

(3 marks)

(ii) What is the probability that less than ten claims are fraudulent ?

(3 marks)

**Q5** (a) An oil prospector in a Company ARICODE will drill a succession of holes in a given area to find a productive well. Therefore, the probability that he is successful on a given trial is 0.2.

(i) Let  $Y$  is the number of trial on which the prospector will find the first productive well. What is the probability that the third hole drilled is the first to yield a productive well ?

(2 marks)

(ii) Suppose the prospector decide to drill exactly ten wells. Let  $X$  is the number of a productive well the prospector will find among ten wells. Then, what is the probability that he will find three productive wells and seven unproductive wells ?

(2 marks)

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- (b) Based on past experience, the main printer in a UNIMAS university computer center is operating properly 90% of the time. Suppose inspections are made at ten randomly selected times.
- (i) What is the probability that the main printer is operating properly for exactly nine of the inspections ?  
(3 marks)
  - (ii) What is the probability that the main printer is not operating properly no more than one inspection ?  
(5 marks)
  - (iii) What is the expected number of inspections in which the main printer is operating properly ?  
(2 marks)
- (c) The time required to complete a Business Statistics final examination in FSTPi is normally distributed, with mean of eighty minutes and a standard deviation of ten minutes.
- (i) What is the probability of completing the examination in one hour or less ?  
(3 marks)
  - (ii) What is the probability a student will complete the exam in a time between sixty and seventy five minutes ?  
(3 marks)

- END OF QUESTION -