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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

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

COURSE NAME : MEDICAL STATISTICS  
COURSE CODE : BWB 43203  
PROGRAMME CODE : BWQ  
EXAMINATION DATE : JUNE 2017  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

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**Q1** Most of studies take place on samples of subjects, whether patients with leukemia or widgets produced by a factory, because it would be prohibitively expensive if not entirely impossible to study the entire population of interest. The sample needs to be a good representation of the study population (the population to which the results are meant to apply) for the researcher to be comfortable using the results from the sample to describe the population. If the sample is biased, meaning it is not representative of the study population, conclusions drawn from the study sample might not apply to the study population. Determine potential types of bias should you be aware of in each of the following scenarios, and what is the likely effect on the results?

(a) A university reports the average annual salary of its graduates as RM 1000, based on responses to a survey of contributors to the alumni fund.  
(6 marks)

(b) A program intended to improve scholastic achievement in high school students reports success because the 40 students who completed the year-long program(of the 100 who began it) all showed significant improvement in their grades and scores on standardized tests of achievement.  
(6 marks)

(c) A manager is concerned about the health of his employees, so he institutes a series of lunchtime lectures on topics such as healthy eating, the importance of exercise, and the deleterious health effects of smoking and drinking. He conducts an anonymous survey (using a paper-and-pencil questionnaire) of employees before and after the lecture series and finds that the series has been effective in increasing healthy behaviors and decreasing unhealthy behaviors.  
(7 marks)

(d) State the differences between case control study and case series study? Give the example for each study given.  
(6 marks)

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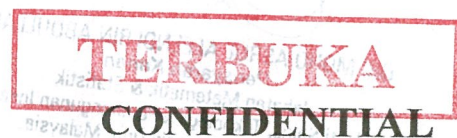
- Q2** One of the most common questions that any statistician gets asked is “How large a sample size do I need?” Researchers are often surprised to find out that the answer depends on a number of factors and they have to give the statistician some information before they can get an answer.
- (a) Give the reason the researchers need to determine the sample size.  
(5 marks)
- (b) State the reason why the standard error and confidence interval important to determine the sample size?  
(2 marks)
- (c) We wish to estimate the mean plasma magnesium level to within 0.01mmol/l with 95% confidence interval. Determine how many patients do we need to sample?  
(5 marks)
- (d) A trial of Salk poliomyelitis vaccine was carried out in the United States. It was decided that vaccine would be considered effective if the number of polio cases fell from 50 per 100,000 in the control group to 30 per 100,000 in the vaccine group. Construct the sample size do they require if level of significance at 0.05 and power study at 90%.  
(6 marks)
- (e) An investigator wishes to estimate the percentage of inhabitants of a large city who are immunized against polio. The previous study some years ago reported that estimated proportion of people immunized was 0.75. The investigator decided that he wanted a 95% chance of his estimate being within  $\pm 5\%$  of the true proportion. Calculate the sample size would be needed to achieve this precision to conduct this study.  
(7 marks)

**Q3** Generations of students at Washington School have taken field trips at both the elementary and secondary levels. The principal wonders if parents still support field trips for children at either level. Five hundred letters were mailed to parents, asking them to indicate either approval or disapproval; 100 parents returned the response postcard. Each postcard indicated whether the parents' children were currently enrolled in elementary or high school, and the parents' approval or disapproval of field trips. **Table Q3** contains the data of parent's opinion about field trips.

**Table Q3:** Parents' Opinion about Field Trips.

	Approve	Disapprove	No Opinion
Elementary	28	14	5
High School	19	28	6

- (a) State the assumptions for the chi-square goodness of fit test. (3 marks)
- (b) Formulate a suitable null and alternative hypothesis. (2 marks)
- (c) Conduct a chi-square test. Do you reject the null hypothesis in **Q3 (b)** at the 0.05 level of significance? (10 marks)
- (d) Determine and state the strongest evidence that might, indeed, be a difference parent's opinion about field trips. (5 marks)
- (e) Briefly discuss and interpret your answer in **Q3(c)** and **Q3 (d)**. (5 marks)



**Q4** In many countries, life tables are based on an average of age-specific death rates for a 3 years' time period, generally around a census taking. In many cases, the life tables are prepared every 10 years. For example, a country or state would collect age-specific death rates for 1999-2001. The census for year 2000 would be used for the base population in **Table Q4**.

**Table Q4: An Abridged Life Table**

Age Interval	${}_nq_x$	$l_x$	${}_nd_x$	$L_x$	$T_x$	$e$
00-01	0.02592	100000	2592	97408	6892855	68.93
42856	0.0042	97408	409	387996	6795447	69.76
05-Oct	0.00232	96999	225	483869	6407451	66.06
Oct-20	0.00201	96774	195	482897	5923582	61.21
15-20	0.00443	96579	428	480757	5440686	56.33
20-25	0.00611	96151	587	477820	4959928	51.58
25-30	0.00632	95564	604	474800	4482108	46.9
30-35	0.00654	94960	621	471695	4007308	42.2
35-40	0.01098	94339	1036	466516	3535613	37.48
40-45	0.01765	93303	1647	458282	3069097	32.89
45-50	0.02765	91656	2534	445610	2610815	28.48
50-55	0.04387	89122	3910	426061	2165205	24.29
55-60	0.05987	85212	5102	400553	1739144	20.41
60-65	0.09654	80111	7734	361884	1338591	16.71
65-70	0.13654	72377	9882	312472	976707	13.49
70-75	0.18765	62494	11727	253837	664235	10.63
75-80	0.25439	50767	12915	189263	410399	8.08
80-85	0.37887	37853	14341	117557	221135	5.84
85-90	0.47898	23511	11261	61250	103578	4.41
90-95	0.57908	12250	7094	25781	42329	3.46
95+	1	5156	5156	16548	16548	3.21

(a) Develop a 5 year survival rate to determine how many women ages 50-54 are expected to live to be 55-59 years age. Which  $L_x$  numbers would be used?

(7 marks)



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- (b) Develop a 10 year survival rate to determine how many women ages 50-54 are expected to live to be 60-64 years of age. (8 marks)
- (c) Calculate 10-year survival rate to estimate net migration. How would survival rates be calculated for the first three cohorts and the last age cohort? (5 marks)
- (d) Calculate a rate for those age 75+ in 1990 who will be age 85+ in year 2000? (5 marks)

**-END OF QUESTIONS-**

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