



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020**

COURSE NAME : SURVEY & SAMPLING METHODS
COURSE CODE : BWB 21103
PROGRAMME CODE : BWQ
EXAMINATION DATE : DECEMBER 2019 / JANUARY 2020
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

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THIS EXAMINATION PAPER CONSISTS OF FIVE (5) PAGES

- Q1** (a) Your team are appointed to conduct a survey for a transportation company in June 2019. The company, Syarikat Prasarana Negara Berhad asked you to find out the passengers' opinion on awareness, usage and satisfaction on light rapid transit (LRT) services in Kuala Lumpur.
- (i) Choose the suitable sampling method to select respondents or samples, among the LRT passengers. Justify your method according to the location involved and number of respondents or samples. (5 marks)
 - (ii) Discuss how the survey will be conducted to collect the response from the respondents or samples. (5 marks)
 - (iii) Explain the suitable analysis method(s) that can be used to analyse the response. Justify why you choose the method(s). (5 marks)
- (b) Define the meaning of census and give **TWO (2)** advantages of using census. (3 marks)
- (c) Explain the importance of doing the pilot survey on a small sample. (2 marks)

- Q2** (a) List all possible simple random samples of size $n = 2$ that can be selected from the population $\{0, 1, 2, 3, 4\}$. Calculate $V(\bar{x})$ for the sample. (8 marks)
- (b) A dentist interested in the effectiveness of a new toothpaste. A group of $N=1000$ school children participated in this study. Pre-study records showed that there is an average of 2.2 cavities every six months for the group. After three months of the study, the dentist sampled $n = 10$ children to determine how they are progressing on the new toothpaste. The data can be shown in **Table Q2(b)**. Construct a 95% confidence interval for \bar{x} .

Table Q2(b)

Children	Number of cavities in the three-month period
1	0
2	4
3	2
4	3
5	2
6	0
7	3
8	4
9	1
10	1

(7 marks)

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- (c) The Fish and Game Department of a state was concerned about the direction of its future hunting programs. To provide for a greater potential for future hunting, the department wanted to determine the proportion of hunters seeking any type of game bird. A simple random sample of $n = 1000$ of the $N = 99,000$ licensed hunters was obtained. Suppose 430 indicated that they hunted game birds. Construct a 95% confidence interval for p .

(5 marks)

- Q3** (a) (i) State **ONE (1)** reason why systematic sampling provides a useful alternative to simple random sampling.

(2 marks)

- (ii) Suppose that a home mortgage company has N mortgages numbered serially in the order that they were granted over a period of 20 years. There is a generally increasing trend in the unpaid balances because of the rising cost of housing over the years. The company wishes to estimate the total amount of unpaid balances. Should you employ a systematic or a simple random sample? Justify your answer.

(3 marks)

- (b) A retail store with four departments has charge accounts arranged by department, with past-due accounts at the top of each departmental list. Suppose the departments average around ten accounts each, with approximately 40% past due. On a given day the accounts might appear as shown in **Table Q3(b)** accompanying table (with account numbers 1 through 40). The store wishes to estimate the proportion of past due accounts by systematic sampling.

Table Q3(b)

	Department			
Account numbers	1-11	12-20	21-28	29-40
Past due accounts	1,2,3,4	12,13,14	21,22,23,24,25	29,30,31,32

- (i) List all possible 1 in 10 systematic samples that should be collected and calculate the variance of the sample proportion.

(9 marks)

- (ii) List all possible 1 in 5 systematic samples that should be collected and calculate the variance of the sample proportion.

(9 marks)

- (iii) Compare the variance result in (i) and (ii). Conclude your answer based on the comparison.

(2 marks)

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- Q4** (a) Elaborate **ONE (1)** condition that makes cluster sampling is the effective design for obtaining a specified amount of information at minimum cost. (2 marks)
- (b) A sociologist wants to estimate the per-capita income in a certain small city. The city has many blocks of houses, two industrial areas and three parks that contain only a few houses. The list of resident adults is available. Explain how he should design the sampling method and survey. (6 marks)
- (c) A manufacturer of band saws wants to estimate the average repair cost per month for the saws he has sold to certain industries. He cannot obtain a repair cost for each saw, but he can obtain the total amount spent for saw repairs and the number of saws owned by each industry. Thus, he decides to use cluster sampling, with each industry as a cluster. The manufacturer selects a simple random sample of $n = 20$ from the $N = 96$ industries he services. The data on total cost of repairs per industry and number of saws per industry are given in the **Table Q4(c)**. Estimate the total amount spent by the 96 industries on band saw repairs using 95% confidence interval.

Table Q4(c)

Industry	Number of saws	Total repair cost	Industry	Number of saws	Total repair cost
1	3	50	11	8	140
2	7	110	12	6	130
3	11	230	13	3	70
4	9	140	14	2	50
5	2	60	15	1	10
6	12	280	16	4	60
7	14	240	17	12	280
8	3	45	18	6	150
9	5	60	19	5	110
10	9	230	20	8	120

(10 marks)

- Q5** (a) Define the stratified random sample. (2 marks)
- (b) An advertising firm is interested in determining how much to emphasize television advertising in a certain region. The firm decides to conduct a survey to estimate the average number of hours each week that households within the region watch television. The region contains of towns A and B, and a rural area. Town A is built around a factory, and most households contain factory workers with school-age children. Town B is an exclusive suburb of a city in a neighboring region and contains older residents with few children at home. There are 155 households in town A, 62 in town B, and 93 in the rural area. Discuss the merits of using stratified random sampling in this situation.

(4 marks)

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- (c) A corporation wishes to obtain information on the effectiveness of a business machine. Several division heads will be interviewed by telephone and asked to rate the equipment on a numerical scale. The divisions are in North America, Europe, and Asia. Hence, stratified sampling is used. The costs are larger for interviewing division heads located outside North America. **Table Q5(c)** gives the costs per interview, approximate variances of the ratings, and N that have been established. Suppose the corporation wish to take a stratified random sample of 50 division heads among the populations established.

Table Q5(c)

Stratum	Location	Population, N	Costs	Variance, σ^2
1	North America	112	9	2.25
2	Europe	68	25	3.24
3	Asia	39	36	3.24

- (i) Calculate the random sample by using the proportional allocation to choose 50 division heads among the populations established. (6 marks)
- (ii) Calculate the random sample by using the optimal allocation to choose 50 division heads among the populations established. (6 marks)

- END OF QUESTIONS -

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