



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

- COURSE NAME : PROBABILITY & STATISTICS II
- COURSE CODE : BWB 10503
- PROGRAMME CODE : BWQ
- EXAMINATION DATE : JULY/ AUGUST 2023
- DURATION : 3 HOURS
- INSTRUCTIONS :
1. ANSWER ALL QUESTIONS
 2. THIS FINAL EXAMINATION IS CONDUCTED VIA
 - Open book
 - Closed book
 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 Answer **TRUE** or **FALSE**. Provide a brief explanation of your reasoning.

(a) If a p -value is greater than 1%, we fail to reject the null hypothesis.

(2 marks)

(b) The statement 'statistically significant effect' means that the null hypothesis was not rejected. If FALSE, provide an example of the cases of the null hypothesis is not rejected.

(3 marks)

Q2 The probability density function is given by

$$f(x) = \begin{cases} \frac{1}{\theta} e^{-x/\theta} & \text{for } x \geq 0 \\ 0 & \text{elsewhere} \end{cases}$$

where the parameter θ is a constant ($\theta > 0$).

(a) Identify the type of distribution.

(1 mark)

(b) Show that $E(X^2) = 2\theta^2$ using properties of the gamma function $\int_0^{\infty} x^{\alpha-1} e^{-x/\beta} dx = \beta^{\alpha} \Gamma(\alpha)$.

(4 marks)

Q3 Suppose that a car arrives at the service centre between a time interval a and b , where X is arrival time.

(a) Identify the distribution and write the probability distribution function.

(3 marks)

(b) Estimate the expected value and variance of $3X + 2$.

(13 marks)

Q4 A wheat flour mill has four processing plants, all of which receive wheat grains in bulk. The amount of wheat that one plant can process in one day can be modelled as having an exponential distribution with a mean of 6 tons for each of the four plants. If the plants operate independently, estimate the amount of wheat flour should be stocked in that plant each day so that the chance of running out of wheat flour is only 0.07.

(5 marks)

Q5 The number of kilometres driven each week by the sales assistant was recorded with a standard deviation of 160 kilometres. Suppose that the population mean number of kilometres driven will be estimated for a year. Compute the probability that the estimate will differ from the true value of more than 30 kilometres.

(5 marks)

Q6 Hydrogenated motor fuel is being tested to study their road hydrogen numbers using two different formulations. The population variance of road hydrogen numbers for Formulation 1 and Formulation 2 are 1.72 and 1.52 respectively. Two random samples of sizes 17 and 22 are tested from Formulation 1 and Formulation 2 with the mean road hydrogen numbers observed are 82.15 and 84.23 respectively. Construct an appropriate hypothesis test to test whether Formulation 2 produces a higher hydrogen number than Formulation 1 at a 5% level of significance.

(10 marks)

Q7 **Table Q7** shows the results of a survey on customer satisfaction levels where two competing cable television companies were compared. A total of 174 customers of Company 1 and 355 customers of Company 2 were randomly selected and they were asked to evaluate their cable companies on a five-point scale.

Table Q7

	Company 1	Company 2
Sample size	174	355
Mean	3.51	3.24
Standard deviation	0.51	0.52

(a) Calculate the point estimate for the difference in the average satisfaction levels of customers and explain your results.

(3 marks)

(b) Construct a 99% confidence interval for the difference in the average satisfaction levels of customers and explain the results obtained.

(6 marks)

- Q8** Table Q8 shows the results of a study conducted to investigate some effects of physical training. A random sample of 10 trainer's weights before the training was collected with all weights given in kilograms. Compute the 98% confidence interval of the mean weights of training and interpret the results.

Table Q8

99	57	62	69	74
77	59	92	70	85

(7 marks)

- Q9** One of the quality measures of the blood glucose test kit is the efficiency of the test results on the same sample of saliva. The efficiency is measured by the variance of the readings in repeated testing. Suppose two types of test kits, Q and R, are compared for their respective efficiency. Suppose a sample of 13 Type Q kit were tested with saliva drops from a well-shaken vial and a sample of 19 Type R kit were tested with the saliva from the same vial. The sample variance of the efficiency of the test results for test kit Type Q and Type R are 1.99 and 1.20, respectively. Execute an appropriate hypothesis test at a 10% level of significance on whether there is sufficient evidence to conclude that the efficiency of the two types of kit is different.

(9 marks)

- Q10** A survey conducted by a travel agent claims that the standard deviation of cost for a hotel room in resorts around Desaru is greater than RM20.90. To test the claim, a researcher selects a sample of 20 resorts with a standard deviation of cost is RM23.20. Execute an appropriate hypothesis test at $\alpha = 0.05$ to test if there is enough evidence to reject the claim.

(9 marks)

- END OF QUESTIONS -