Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	PROBABILITY & STATISTICS II
COURSE CODE	:	BWB 10503
PROGRAMME CODE	:	BWQ
EXAMINATION DATE	:	JULY 2024
DURATION	:	2 HOURS 30 MINUTES
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.

TERBUKA

Q1 Explain **TWO (2)** differences between Binomial distribution and Negative Binomial distribution.

(4 marks)

Q2 Suppose $x_1, x_2, \ldots, x_n$ are a random sample from a population with a probability density function (PDF) of

$$f(x) = \frac{1}{\theta} x^{(1-\theta)/\theta}, \quad 0 < x < 1, \theta > 0$$

Construct the maximum likelihood estimator of θ.

(5 marks)

Q3 The monthly repairing time X (in hours) for a washing machine manufacturing in company AXA follows specific distribution, with $\alpha = 2$ and $\beta = 3$. The monthly loss M (in MYR) to the production because of this downtime is given by

$$M = 20X + 3X^2$$

(a) Estimate whether the yearly expected loss will exceed MYR 4000.

(7 marks)

(b) Estimate the variance loss.

(8 marks)

Q4 The time (in hours) to repair a machine follows an Exponentially distributed random variable with a parameter $\lambda = \frac{1}{3}$. Estimate the probability that a repair time exceeds 3 hours.

(4 marks)

Q5 The production audit report indicates that the time (in hours) to repair a machine is following an Exponential distribution random variable with a parameter $\lambda = \frac{1}{2}$. Calculate the conditional probability that the repair takes at least 10 hours, given that its duration exceeds 9 hours.

(6 marks)

TERBUKA

Q6 A new fertiliser is being examined to compare its effectiveness in promoting plant growth against a standard fertiliser. The population variance of plant growth measurements for the standard and new fertilisers are 2.05 and 2.15, respectively. Two random samples of sizes 25 and 30 are taken from plants treated with the standard and new fertilisers, resulting in mean plant growth measurements of 12.5 and 13.2, respectively. Develop an appropriate hypothesis test at a 10% significance level to determine if the new fertiliser leads to significantly higher plant growth than the standard fertiliser.

(10 marks)

Q7 **Table Q7.1** shows the results from a study on the ability of individuals to walk in a straight line that is based on the article titled "Can we really walk straight?" in the American Journal of Physical Anthropology 1992:19-27, which reported that the accompanying data on cadence (strides per second) for a sample of 13 randomly selected healthy men.

Table Q7.1

0.95	0.78	0.85	0.92	0.95	0.93	0.93
0.86	1.00	0.92	0.85	0.81	0.93	

(a) Identify the suitable test to construct the confidence interval for the ability of individuals to walk in a straight line and explain your answer.

(2 marks)

(b) Test if there is evidence that 95% of the sample would contain the true population mean cadence to walk in a straight line. Interpret the results.

(7 marks)

Q8 The lateral expansion (mils) amount was determined for a sample of nine pulsed-power gas metal arc welds used in LNG ship's containment tanks. The results show that the sample standard deviation was 2.8 mils. Assuming that the distribution is normal, compute the 95% confidence interval for variance and standard deviation.

(7 marks)

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Q9 One of the quality measures of two brands of weight scales is the consistency of weight measurements on the same set of objects. The consistency is assessed by examining the variance of weight measurements taken repeatedly. Let us consider Brand X and Brand Y weight scales with a sample of 15 Brand X scales used to measure the weights of specific objects and a sample of 20 Brand Y scales measured for the same objects. The sample variances of the weight measurements for Brand X and Brand Y are 3.75 and 2.50, respectively. Conduct an appropriate hypothesis test at a 10% significance level to determine if enough evidence suggests that the consistency of weight measurements differs between the two brands of scales.

(11 marks)

Q10 A study was conducted by a restaurant critic who suggested that the price variation of main courses in fine dining restaurants in a particular city exceeds RM15. To investigate this claim, a researcher randomly selects 25 fine dining restaurants and finds that the standard deviation of main course prices is RM17.50. Perform a hypothesis test at a significance level of 5% to evaluate if there is significant evidence to dispute the restaurant critic's claim regarding the variation in meal prices.

(9 marks)

- END OF QUESTIONS -

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