



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**(ONLINE)  
FINAL EXAMINATION  
SEMESTER I  
SESSION 2020/2021**

**COURSE NAME** : STATISTICS FOR ENGINEERING  
TECHNOLOGY

**COURSE CODE** : BWM 22502

**PROGRAMME CODE** : BNA / BNB / BNC / BND / BNE/ BNF /  
BNM / BNN

**EXAMINATION DATE** : JANUARY 2021 / FEBRUARY 2021

**DURATION** : 2 HOURS 30 MINUTES

**INSTRUCTION** : ANSWER ALL QUESTIONS.  
**OPEN BOOK EXAMINATION**

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

- Q1**
- (a) A soft drink vending machine is set so that the amount of drink dispensed is a random variable follow a normal distribution with mean of 300 ml and a standard deviation is 17 ml.
- (i) Calculate the probability that the amount of drink dispensed is at least 204 ml  
(3 marks)
- (ii) Calculate the probability of the average amount of drink dispense in the sample of size 36 at least 204 ml.  
(3 marks)
- (b) An automobile battery manufacturer claims that its midgrade battery has a mean life of 50 months with a standard deviation of 6 months. Suppose that the battery lives is approximately normally distributed.
- (i) Calculate the probability that a randomly selected 16 battery of this type will last less than 48 months.  
(3 marks)
- (ii) Suppose an engineer selected a sample of size 49 instead of 16. Explain, if the sample size affects the standard error of the sample mean  
(3 marks)
- (c) The effective life of a bulb used in a car light is a random variable with mean of 3400 hours and standard deviation of 25 hours. The distribution of effective life is fairly close to a normal distribution. The car manufacturer introduces an improvement into the manufacturing process for this bulb that increases the mean life to 4000 hours and decreases the standard deviation to 15 hours. Given a random sample of 20 bulbs is selected from the old process and 35 bulbs are selected from the improved process.
- (i) Compute the probability that the mean of old process is more than 3403 hours.  
(6 marks)
- (ii) Calculate the probability that the difference between sample mean of improved and old process is at least 603 hours.  
(7 marks)
- Q2**
- (a) An instructor wishes to know the mean of students' examination scores in his institute. A sample size of 110 students' examination scores was selected randomly, and their mean were 66 and a standard deviation of 0.06. The error for the estimated mean was predefined as much as 1%
- (i) Compute the respected standardised normal value.  
(4 marks)
- (ii) Calculate the percentage of sample means will fall within this error value.  
(4 marks)

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- (b) A survey on customer satisfaction levels of two competing cable television companies were compared. 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 five point scale. The results are summarized in **Table Q2(b)**.

**Table Q2(b)**

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

- (i) Calculate the point estimate for the difference in the average satisfaction levels of customers and explain your results. (3 marks)
- (ii) Construct a 99% confidence interval for the difference in the average satisfaction levels of customers and explain the results obtained (6 marks)
- (c) A manufacturer produces gearbox for an automobile engine. The lifetime of gearbox after 60,000 km is of interest because it is likely to have an impact to warranty claims. A random sample of 15 gearboxes is tested and obtained a standard deviation of 0.85. Construct a 95% confidence interval for the lifetime of gearbox standard deviation. (8 marks)

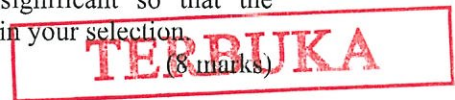
**Q3**

- (a) An automobile engineer claim that his team has successfully designed a new engine that saves more car fuel than the previous designs. He wishes to prove that by conducting on road experiment to compare both designs. A sample of 40 cars of previous and new engines version were involved in the experiment and the data were recorded in **Table Q3(a)**.

**Table Q3(a)**

	Mean	Variance
Previous version	0.09	0.015
New version	0.05	0.028

- (i) State the null hypothesis and all possibility of the alternative hypothesis. Explain the meaning of each notation. (5 marks)
- (ii) Select a range of an appropriate level of significant so that the engineer's claim could be accepted. Then, explain your selection. (8 marks)



- (b) A car manufacturer claims that compact cars have lower average miles per gallon (mpg) than sedan. Suppose that an engineer has tested eight compact cars and obtained an average of 31 mpg with a standard deviation of seven mpg. Whereas the eight sedan cars obtained an average of 22 mpg with a standard deviation of four mpg.
- (i) Carry out an appropriate test on the car manufacturer's claim that the variance of compact car is more than the variance of sedan car at 0.01 level of significance. Explain your results.  
(8 marks)
- (ii) Explain the changes on conclusion in **Q3(b)(i)**, if the sample standard deviation is changed to seven for compact car and two for sedan car  
(4 marks)

**Q4** An experiment was conducted to investigate the effect of water temperature on the rate of solution for sodium thiosulfate. The rate of solution is measured by measuring the weight of the sodium thiosulfate that can be completely dissolved in one minute. The data were recorded as shown in **Table Q4**.

**Table Q4**

Temperature (Degree Celsius)	20	22	24	26	28	30	32	34
Sodium thiosulfate (milligrams)	5.6	6.1	7.3	9.2	10.8	12.3	13.9	15.7

- (a) Based on the experiment, explain the relevant variables involved in simple linear regression.  
(6 marks)
- (b) Explain the weight of dissolved sodium thiosulfate change when the water temperature is changed. Construct an appropriate equation to support your explanation.  
(11 marks)
- (c) Determine how well the rate of solution for sodium thiosulfate can be explained by the equation in **Q4(b)**.  
(5 marks)
- (d) Examine the relationship between water temperature and the rate of solution for sodium thiosulfate.  
(3 marks)

- END OF QUESTIONS -

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