



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2017/2018**

COURSE NAME : STATISTICS AND PROBABILITY II
COURSE CODE : BWB 10303
PROGRAMME CODE : BWA / BWQ
EXAMINATION DATE : DECEMBER 2017 / JANUARY 2018
DURATION : 3 HOURS
INSTRUCTION : ANSWERS ALL QUESTIONS

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

- Q1** (a) A survey by KRC Research for *U.S. News* reported that 37% of people plan to spend more on eating out after they retire while 45% of people and/or their spouse had saved some money for retirement.
- (i) On average, compute the number of people who plan to spend more on eating out after they retire would be expected in each sample of 50? (3 marks)
 - (ii) If a random sample of 50 people is taken, find the probability that 21 but less than 30 people and/or their spouse had saved some money for retirement. (5 marks)
- (b) A soft-drink machine is regulated so that it discharges an average of 200 milliliters per cup. If the amount of drink distributed with a standard deviation equal to 15 milliliters,
- (i) obtain the fraction of the cups will contain more than 224 milliliters? (4 marks)
 - (ii) calculate the number of cups will probably overflow if 230-milliliters cups are used for the next 1000 drinks? (5 marks)
- (c) On average, a textbook author makes two word-processing errors per page on the first draft of her textbook. Compute the probability that she will make
- (i) four or more errors on the next two pages? (3 marks)
 - (ii) not more than ten errors on the next ten pages? (5 marks)

Q2 A taxi company is trying to decide whether to purchase brand *A* or brand *B* tires for its fleet of taxis. To estimate the difference in the two brands, an experiment is conducted using 12 of each brand. The tires are run until they wear out. The results are

Brand *A* : $\bar{x} = 36300$ kilometers
 $s = 5000$ kilometers

Brand *B* : $\bar{x} = 38100$ kilometers
 $s = 6100$ kilometers

- (a) Construct a 95% confidence interval for the standard deviation of the brand *A*. (10 marks)
- (b) If the variances of the populations are equal,
 - (i) determine an appropriate distribution for this problem. Give your reason. (3 marks)
 - (ii) compute a 90% confidence interval for the difference between the average kilometers for these two brand tires. Interpret your result. (12 marks)

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Q3 The Haines Lumber Company makes plywood for the furniture industry. One product it makes is 3/4-inch oak veneer panels. It is very important that the panels conform to specifications. One specification calls for the panels to be made to an average thickness of 0.75 inches and standard deviation of 0.1 inches. Each hour, 5 panels are selected at random and measured. After 20 hours a total of 100 panels have been measured.

- (a) Formulate the appropriate null and alternative hypotheses. (4 marks)
- (b) Identify either the hypothesis tests a left-tailed, right-tailed or two-tailed test. (1 mark)
- (c) Construct the rejection region if the test using a 0.05 level of significance. (5 marks)
- (d) Based on the sample data, what should the company conclude about the status of its product meeting the thickness specification if the sample mean thickness for 100 panels is 0.78 inches? (9 marks)
- (e) Calculate the power of the test? (6 marks)

Q4 A study is conducted to compare the lengths of time required by men and women to assemble a certain product. Past experience indicates that the distribution of the times for both men and women is approximately normal but the variance of the times for women is less than that for the men. A random sample of times for 13 men and 17 women produced the following data:

$$\begin{array}{ll} \text{Men : } n_1 = 13 & \text{Women : } n_2 = 17 \\ s_1 = 6.9 & s_2 = 5.1 \end{array}$$

- (a) Based on the sample data, is there sufficient evidence to conclude that the the variance of the times for women is less than that for the men at 0.025 level of significance. (12 marks)
- (b) If a random sample of times for 20 men has a standard deviation of 6.5, conduct a hypothesis test to determine if the standard deviation is less than 6.9 at 0.05 level of significance. (13 marks)

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- END OF QUESTIONS -

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FORMULA

$$\bar{x} - z_{\alpha/2} \frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$$\bar{x} - t_{\alpha/2, v} \left(\frac{s}{\sqrt{n}} \right) < \mu < \bar{x} + t_{\alpha/2, v} \left(\frac{s}{\sqrt{n}} \right)$$

$$(\bar{x}_1 - \bar{x}_2) - z_{\alpha/2} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} < \mu_1 - \mu_2 < (\bar{x}_1 - \bar{x}_2) + z_{\alpha/2} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

$$(\bar{x}_1 - \bar{x}_2) - t_{\frac{\alpha}{2}, v} \sqrt{\frac{1}{n} (s_1^2 + s_2^2)} < \mu_1 - \mu_2 < (\bar{x}_1 - \bar{x}_2) + t_{\frac{\alpha}{2}, v} \sqrt{\frac{1}{n} (s_1^2 + s_2^2)}$$

$$(\bar{x}_1 - \bar{x}_2) - t_{\frac{\alpha}{2}, v} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} < \mu_1 - \mu_2 < (\bar{x}_1 - \bar{x}_2) + t_{\frac{\alpha}{2}, v} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

$$(\bar{x}_1 - \bar{x}_2) - t_{\frac{\alpha}{2}, v} S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} < \mu_1 - \mu_2 < (\bar{x}_1 - \bar{x}_2) + t_{\frac{\alpha}{2}, v} S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$S_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$$

$$\frac{(n-1)s^2}{\chi_{\alpha/2, v}^2} < \sigma^2 < \frac{(n-1)s^2}{\chi_{1-\alpha/2, v}^2}$$

$$\frac{s_1^2}{s_2^2} \frac{1}{f_{\alpha/2}(v_1, v_2)} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{s_1^2}{s_2^2} f_{\alpha/2}(v_2, v_1)$$

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$$

$$F = \frac{s_1^2}{s_2^2}$$

