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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I SESSION
2014/2015

COURSE NAME	:	MATHEMATICS III
COURSE CODE	:	BPV 20303
PROGRAMME CODE	:	BBV
EXAMINATION DATE	:	DECEMBER 2014/JANUARY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL FOUR (4)** QUESTIONS

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

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Q1 (a) What is a sampling distribution? Give example

(5 marks)

(b) The mature citrus trees of type *A* have a mean height of 14.8 feet with a standard deviation of 1.2 feet. The mature citrus of type *B* have a mean height of 12.9 feet with a standard deviation of 1.5 feet. Two samples of size 12 and 15 are randomly selected from mature citrus tree of type *A* and *B* respectively. Find the probability that;

(i) the mean of type A is more than 14 feet.

(ii) the mean of type B is between 12 to 14 feet.

(20 marks)

Q2 (a) What do you understand by confidence interval? Give your example.

(5 marks)

(b) A manufacturer is interested in the output voltage of a power supply used in a PC. Output voltage is assumed to be normally distributed, with a standard deviation 1.25V. How large a sample must be selected if he want to be 99% confidence of finding whether the true man differs from this sample mean by 0.3V.

(10 marks)

(c) A consumer organization collected data on two types of automobile batteries, *A* and *B*. Both populations are normally distributed with standard deviations of 1.29 for Batteries *A* and 0.88 for Batteries *B*. The summary statistics for 40 observations of each type yielding average mean of 32.25 hours and 29.81 hours for Batteries *A* and Batteries *B* respectively. Construct 90% confidence interval for difference between means life hours for Batteries *A* and Batteries *B*.

(10 marks)

Q3 (a) The score of driving test has a normal distribution with mean 70 if given the standard deviation of sample is eight. A driving school's instructor claimed that if the candidate learned more than three hours per week, the mean score would be different than 70. A driving test was given to a random sample of 50 candidates with the mean score was 78. Test the claim at 5% level of significance.

(15 marks)

(b) An extra preparation class is advertised to improve the scores with random sample of 30 data and a standard deviation is 2.1 hours which is approximately normally distributed. Assume the standard deviation of the scores is 1.7 hours. Use alpha equal of 0.02, test the hypothesis of variance population is greater than 2.89 hours.

(10 marks)

Q4 (a) Raw material used in the production of a synthetic fiber is stored in a place that has no humidity control. Measurements of the relative humidity and the moisture content of samples of the raw material (both in percentage) on 12 days yielded the following results:

Humidity (x)	Moisture content (y)
46	12
53	14
37	11
42	13
34	10
29	8
60	17
44	12
41	10
48	15
33	9
40	13

(i) Fit a least squares line that will enable us to predict the moisture content in terms of the relative humidity. Interpret the result.

(20 marks)

(ii) Estimate the moisture content when the relative humidity is 38 percent.

(5 marks)

-END OF QUESTION-

FINAL EXAMINATION

Sampling Distributions :

$$\overline{X} \sim N(\mu, \sigma^2/n),\ Z = \frac{\overline{X}-\mu}{\sigma/\sqrt{n}} \sim N(0,1),\ T = \frac{\overline{x}-\mu}{s/\sqrt{n}},\ \overline{X}_1 - \overline{X}_2 \sim N\left(\mu_1 - \mu_2, \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right).$$

Estimations :

$$n = \left(\frac{Z_{\alpha/2}\cdot\sigma}{E}\right)^2,\ \left(\bar{x}_1 - \bar{x}_2\right) - Z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} < \mu_1 - \mu_2 < \left(\bar{x}_1 - \bar{x}_2\right) + Z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}},$$

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

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

Hypothesis Testing's:

$$Z = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}},\ T = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{S_p \cdot \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \text{ with } v = n_1 + n_2 - 2,$$

$$Z = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}},\ T = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{1}{n}\left(s_1^2 + s_2^2\right)}},;$$

Simple Linear Regressions :

$$S_{xy} = \sum x_i y_i - \frac{\sum x_i \cdot \sum y_i}{n},\ S_{xx} = \sum x_i^{\,2} - \frac{\left(\sum x_i\right)^2}{n},\ S_{yy} = \sum y_i^{\,2} - \frac{\left(\sum y_i\right)^2}{n},\ \bar{x} = \frac{\sum x}{n},$$

$$\bar{y} = \frac{\sum y}{n},\ \hat{\beta}_1 = \frac{S_{xy}}{S_{xx}},\ \hat{\beta}_0 = \bar{y} - \hat{\beta}_1\bar{x},\ \hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x,\ r = \frac{S_{xy}}{\sqrt{S_{xx}\cdot S_{yy}}},\ SSE = S_{yy} - \hat{\beta}_1 S_{xy}$$