UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2010/2011

COURSE	:	STATISTICS FOR REAL ESTATE MANAGEMENT
CODE	:	BSM1822
PROGRAMME	:	4 BPD
DATE	:	NOVEMBER / DECEMBER 2010
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER **ALL** QUESTIONS IN **PART A** AND **THREE (3)** QUESTIONS IN **PART B**.

THIS EXAMINATION PAPER CONSISTS OF 7 PAGES

PART A

Q1 **Table Q1** shows the elongation (in thousands of an inch) of steel rods of nominally the same composition and diameter when subjected to various tensile forces (in thousands of pounds).

Table Q1 : The data of elongation (in thousands of an inch) of steel and various tensile forces rods (in thousands of pounds)

Force (x)	Elongation (y)
1.2	15.6
5.3	80.3
3.1	39.0
2.2	34.3
4.1	58.2
2.6	36.7
6.5	88.9
8.3	111.5
7.6	99.8
4.9	65.7

(a) Find the value of Σx_i, Σy_i, Σx_i^2, Σy_i^2 and $\Sigma x_i y_i$.

(4 marks)

(b) Calculate the sample correlation coefficient and interpret the result.

(3 marks)

(c) Using the least square method, find the regression line that approximates the elongation of steel rods.

(5 marks)

(d) Calculate the value of *SSE* and *MSE*.

(2 marks)

(e) Test the null hypothesis $\beta_1 = 13$ against the alternative hypothesis $\beta_1 > 13$ at the 0.01 level of significance.

(6 marks)

Q2 (a) The mean height of 10 male students who participated in football team was 170.5 cm with a standard deviation of 6.25 cm. Another 13 male students who showed no interested in football had a mean height of 168.75 cm with a standard deviation of 7 cm. Test the hypothesis that male students who participate in football team are taller than other male students. Use 0.05 level of significance.

(7 marks)

(b) A teacher wishes to see whether the variation in scores of the 23 students in her class is less than the variance of the population. The variance of the class is 198. Is there enough evidence to support the claim that the variation of students is less than the population variance ($\sigma^2 = 225$) at $\alpha = 0.05$? Assume that the scores are normally distributed.

(6 marks)

(c) A sample of 13 teachers from Kuala Terengganu has an average salary RM 2500 per month, with a standard deviation of RM 115. Another sample of 13 teachers from Tanjung Karang has an average salary of RM 2710 per month, with a standard deviation of RM98. Test the hypothesis that the ratio of teachers salaries between Kuala Terengganu and Tanjung Karang are different by using 0.05 level of significance.

(7 marks)

PART B

Q3 Given the probability density function of X:

$$f(x) = \begin{cases} k(4 - x^2), & 0 \le x \le 2 \\ 0, & \textit{otherwise} \end{cases}$$

(a) Find the value of k.

(3 marks)

(b) Find the cumulative distribution function of X.

(4 marks)

(c) Find $P(0 \le x \le 3)$.

(3 marks)

(d) $E(X)$ and $E(5X + 3)$.

(5 marks)

(e) $Var(2X - 35)$.

(5 marks)

Q4 (a) Imperfections in computer circuit boards and computer chips lend themselves to statistical treatment. For particular type of board the probability of a diode failure is 0.03. Suppose a circuit board contains 200 diodes.

(i) What is the standard deviation and mean number of failures among the diodes?

(ii) The board will work if there are no defective diodes. Using the suitable approximation, find the probability that a board will work?

(iii) Find the probability that between two and five of failures among the diodes.

(10 marks)

(b) In the factory, the boards are cut by a machine and the board length after cut has mean of 1.5 meter and a standard deviation of 0.6 meter.

(i) Write down the distribution of the board length.
(ii) Compute the probability of board that its length is less than 1.2 meter.
(iii) Compute the probability of board that its length is between than 1.3 meter and 1.8 meter.
(iv) If the length is more than 2 meter, the board cannot be used. So the board must be cut again. If 1000 boards are cut per day, find the number of boards that will be cut again.

(10 marks)

Q5 (a) The distribution of salaries of salesmen is normally distributed. From the past experience, the salaries of salesmen showed a mean of RM 4000 and a standard deviation of RM 900. Find the probability that the mean of the salaries of 40 randomly selected salesmen will

(i) exceed RM 4500.
(ii) between RM 3800 to RM 4300.
(iii) not more than RM 3700.

(8 marks)

(b) The television picture tubes of manufacturer ***A*** have a normal distribution with a mean lifetime of 6.5 years and standard deviation of 0.9 years. Meanwhile, manufacturer ***B*** has a normal distribution with a mean lifetime of 6.0 years and a standard deviation of 0.8 years. Find the probability that random sample of

(i) size 36 tubes from manufacturer ***A*** will have a mean lifetime that is at least 1 year more than the mean lifetime of a sample of 49 tubes from manufacturer ***B***?
(ii) size 14 tubes from manufacturer ***A*** will have a mean lifetime that is at least 1 year more than the mean lifetime of a sample of 11 tubes from manufacturer ***B***?

(12 marks)

Q6 A set data of height (in centimeter) of male and female students was obtained last semester. **Table Q4** in the next page shows the data of the height for male and female students.

Table Q4: Data of the height for male and female students

Male	171	178	167	169	175	180	172	163
Female	165	160	155	167	150	153	148	158

(a) Construct 99% confidence interval for the difference between two means of the height for male and female students when the population variances for students are equal.

(13 marks)

(b) Construct 95% confidence interval for the ratio population variances, $\dfrac{\sigma^2 male}{\sigma^2 female}$.

(7 marks)

FINAL EXAMINATION

SEMESTER / SESSION: SEM I / 2010/2011 COURSE: 4 BPD

SUBJECT : STATISTICS FOR REAL ESTATE MANAGEMENT CODE: BSM1822

Formulae

Random variables:

$$\sum_{i=-\infty}^{\infty} P(x_i) = 1, \quad E(X) = \sum_{\forall x} x \cdot P(x), \quad E(X^2) = \sum_{\forall x} x^2 \cdot P(x), \quad \int_{-\infty}^{\infty} f(x)\, dx = 1,$$

$$E(X) = \int_{-\infty}^{\infty} x \cdot P(x)\, dx, \quad E(X^2) = \int_{-\infty}^{\infty} x^2 \cdot P(x)\, dx, \quad Var(X) = E(X^2) - [E(X)]^2.$$

Special Probability Distributions :

$$P(x=r) = {}^nC_r \cdot p^r \cdot q^{n-r},\ r = 0, 1, \ldots, n,\ X \sim B(n, p),\ P(X=r) = \frac{e^{-\mu} \cdot \mu^r}{r!},\ r = 0, 1, \ldots, \infty,$$

$$X \sim P_0(\mu),\ Z = \frac{X-\mu}{\sigma},\ Z \sim N(0,1),\ X \sim N(\mu, \sigma^2).$$

Sampling Distributions :

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

Estimations :

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

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

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

where Pooled estimate of variance, $S_p^2 = \frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1 + n_2 - 2}$ with $v = n_1 + n_2 - 2$,

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

$$\left(\bar{x}_1 - \bar{x}_2\right) - t_{\alpha/2,v}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} < \mu_1 - \mu_2 < \left(\bar{x}_1 - \bar{x}_2\right) + t_{\alpha/2,v}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} \text{ with } v = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}},$$

$$\frac{(n-1) \cdot s^2}{\chi^2_{\alpha/2,v}} < \sigma^2 < \frac{(n-1) \cdot s^2}{\chi^2_{1-\alpha/2,v}} \text{ with } v = n-1,$$

$$\frac{s_1^2}{s_2^2} \cdot \frac{1}{f_{\alpha/2}(v_1, v_2)} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{s_1^2}{s_2^2} \cdot f_{\alpha/2}(v_2, v_1) \text{ with } v_1 = n_1 - 1 \text{ and } v_2 = n_2 - 1.$$

Hypothesis Testings :

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

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

$$v = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}} \, ; \quad S_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2} \; ; \quad \chi^2 = \frac{(n-1)s^2}{\sigma^2}$$

Simple Linear Regressions :

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

$$\hat{\beta}_1 = \frac{S_{xy}}{S_{xx}}, \quad \hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x}, \quad \hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x, \quad r = \frac{S_{xy}}{\sqrt{S_{xx} \cdot S_{yy}}}, \quad SSE = S_{yy} - \hat{\beta}_1 S_{xy}, \quad MSE = \frac{SSE}{n-2},$$

$$T = \frac{\hat{\beta}_1 - \beta_1^*}{\sqrt{\frac{MSE}{S_{xx}}}} \sim t_{n-2}, \quad T = \frac{\hat{\beta}_0 - \beta_0^*}{\sqrt{MSE\left(\frac{1}{n} + \frac{\bar{x}^2}{S_{xx}}\right)}} \sim t_{n-2}.$$