UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2009/10

SUBJECT	:	STATISTICS FOR REAL ESTATE MANAGEMENT
CODE	:	BSM 1822
COURSE	:	1 BPD
DATE	:	APRIL 2010
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER ALL QUESTIONS IN **PART A** AND **TWO (2)** QUESTIONS IN **PART B**

THIS EXAMINATION PAPER CONSISTS OF 6 PAGES

PART A

Q1 (a) Director of the human resource claims that the average starting salary for their executive managers is RM48,000 per year. Is there enough evidence to reject the director's claim at $\alpha = 0.05$ if

(i) a sample of 10 executive managers has a mean of RM48,450 and a standard deviation of RM400?

(ii) a sample of 40 executive managers has a mean of RM48,900 and a variance of RM90,000?

(12 marks)

(b) An experiment was conducted to assess the effect of using magnets at the filter point in the manufacture of coffee filter packs. The data in **Table Q1(b)** presents the weight of filter pack packs in gram.

Table Q1(b): Weight of filter packs

20.1	20.1	19.5	19.4	19.8	20.4	19.9	20.5	19.7

At 0.05 level of significant, test whether the variance of the weight is less than 0.16 gram.

(8 marks)

Q2 In a study relating the degree of warping of a copper plate (in mm), y to temperature (in ^{o}C), x, the following summary statistics were calculated:

$$n = 40,\ \sum_{i=1}^{n}(x-\bar{x})^2 = 98{,}775,\ \sum_{i=1}^{n}(y-\bar{y})^2 = 19.10,\ \bar{x} = 26.36,\ \bar{y} = 0.5188 \text{ and}$$

$$\sum_{i=1}^{n}(x-\bar{x})(y-\bar{y}) = 826.94$$

(a) Compute the least-squares equation for predicting warping from temperature and interpret your result.

(4 marks)

(b) Predict the warping at a temperature of 40^{0}C.

(2 marks)

(c) At what temperature will we predict the warping to be 0.5 mm?

(2 marks)

(d) Compute the coefficient of correlation r between the degree of warping and the temperature.

(2 marks)

(e) Compute the coefficient of determination and interpret your result.

(2 marks)

(f) At significance level, $\alpha = 0.05$, test if there is a significance relationship between warping and temperature. What is your conclusion?

(8 marks)

PART B

Q3 The concentration of a reactant is a random variable with probability density function given below:

$$f(x) = \begin{cases} 1.2(x + x^2), & 0 < x < 1, \\ \\ 0, & \text{otherwise.} \end{cases}$$

Find

(a) the probability that the concentration is greater than 0.55.

(4 marks)

(b) the mean of the concentration.

(3 marks)

(c) the probability that the concentration is within $\pm$ 0.1 of the mean.

(5 marks)

(d) the standard deviation, σ of the concentrations.

(3 marks)

(e) the probability that the concentration is within $\pm 2\sigma$ of the mean.

(5 marks)

Q4 In Malaysia only 4% of people have Type AB blood.

(a) How many donors must be checked to find on the average one donor with Type AB blood?

(2 marks)

(b) Among 50 donors, what is the probability that:

(i) at most five donors with Type AB blood?

(ii) Exactly one donor with Type AB blood?

(11 marks)

(c) Among 300 donors, what is the probability that less than 10 donor with Type AB blood?

(7 marks)

Q5 (a) The waiting time of clients in a bank is normally distributed with mean 3.2 minutes with a standard deviation 1.6 minutes. If a random 49 clients is selected, find

(i) the sampling distribution of the mean waiting time.

(ii) the probability that the mean waiting time at a bank is less than 3.0 minutes.

(iii) the probability that the mean waiting time at a bank is at least 2.8 minutes but less than 3.55 minutes.

(8 marks)

(b) Study on height of male and female students was conducted at certain university and assume that the students height is normally distributed. The mean height of male students is 175.5 cm and standard deviation of 1.25 cm, while female students have an mean height of 168.6 cm and standard deviation of 1.82 cm. Assume that 36 male students and 30 female students were selected randomly, find,

(i) the probability that the average height of male students is between 175 and 176 cm.

(ii) the probability that the different average between height of male and female students at least 6.5 cm.

(iii) the probability that the average height of male students at least 6 cm more than height of female students.

(12 marks)

Q6 The data in **Table Q6(a)** are numbers of accident cases occurs in Malaysia from January to December for the year 2006 and 2007. Assume that the variances of 2007 and 2008 are equal.

Table Q6(a) Numbers of accident occurs in Malaysia from January to December for the year 2006 and 2007

Month	**Year**	
	2006	**2007**
1	51441	62445
2	46793	49834
3	50476	56032
4	56806	52458
5	51318	54391
6	45168	49620
7	50303	60040
8	53663	57179
9	51721	54114
10	70792	61381
11	53737	54172
12	52867	56507

Source: Malaysia Road and Safety Department

(a) Construct 95% confidence interval for the difference between two means accident cases for the year 2006 and 2007.

(13 marks)

(b) Construct 95% confidence interval for the ratio of two variances accident cases for the year 2006 over the year 2007.

(7 marks)

FINAL EXAMINATION

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Formulae

Random variables:

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

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

Special Probability Distributions :

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

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

Sampling Distributions :

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

Estimations :

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

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

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

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

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

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

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

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

Hypothesis Testings :

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

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

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

Simple Linear Regressions :

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

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

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