UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2009/2010

SUBJECT	:	STATISTICS
CODE	:	DSM 2932
COURSE	:	2 DEE, DFA, DDM, & DDT
DATE	:	APRIL 2010
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER ALL QUESTIONS IN PART A AND CHOOSE TWO (2) QUESTIONS IN PART B

THIS EXAMINATION PAPER CONSISTS OF 6 PAGES

PART A

Q1 (a) In a large university, the average score in a examination is 82%. Thirty eight students are to go through an hour meditation before the first examination. The mediator averaged is 84% in the examination with a standard deviation of 5%. Does student do better in the examination before the first examination of meditation? What we can conclude that at 0.05 level of significant?

(11 marks)

(b) There are 39 cats and 40 dogs was tested to determine if there are difference in the average number of days that animal can survive without food. The cats average are 11 days with a standard deviation of 2 days while the dogs averaged are 12 days with a standard deviation of 3 days. What we can conclude at 0.01 level significant?

(14 marks)

Q2 The following **Table Q2** shows the earnings per share (RM) and dividends per share (RM) for eight electric utility companies in a recent year.

Table Q2 : The earnings & dividends per share (RM)

Earnings per share, X	2.78	1.41	2.74	0.92	2.44	3.50	3.68	1.97
Dividends per share, Y	2.16	0.88	1.04	1.10	0.96	2.18	1.54	1.39

(a) Sketch a scatter plot for the above data.

(4 marks)

(b) Use the method of least squares to estimate the regression line and interpret the result.

(11 marks)

(c) Estimate the dividend per share if given the earnings per share is RM 4.02.

(2 marks)

(d) Calculate the coefficient of Pearson correlation and interpret the result.

(3 marks)

(e) Calculate the coefficient of determination and interpret the result.

(5 marks)

PART B

Q3 (a) A certain type of component are packed in a lot of four. Let X is represent the number of properly functioning components in a randomly chosen lot. The probability distribution function of X is given by

$$p(x) = \begin{cases} cx, & x = 1,2,3,4 \\ 0, & \text{otherwise} \end{cases}$$

where c is constant. Find the

(i) value of c,
(ii) probability the number of properly functioning exactly two and four,
(iii) mean of properly functioning components,
(iv) variance of properly functioning components.

(11 marks)

(b) Let k is a constant and consider the continuous distribution function,

$$f(x) = \begin{cases} k(1-x)\ ; & 0 < x < 1 \\ 0 \quad ; & \text{otherwise} \end{cases}$$

Find
(i) the value of k,
(ii) $p(X \leq 0.2)$,
(iii) $p(0.5 < X < 0.7)$.

(14 marks)

Q4 (a) The probability that a student is accepted to a prestigious college is 0.3. If fifteen students from the same school apply to this college,

(i) what is the probability that at most two are accepted ?
(ii) Calculate the mean and variance for the accepted students.

(8 marks)

(b) In an English test, the score of the candidates were approximately normal distributed with a mean 210 points and standard deviation of 45 points. Find the probability of the candidates who received scores;

(i) greater than 160 points,
(ii) between 155 and 165 points.

(9 marks)

(c) The factory company in Perak had found out that the probability of cartridges failed to be sold is 40%. By consider the distribution as binomial, 500 cartridges were selected at random by the customer in the show room. Find the probability that less than 210 cartridges failed to be sold.

(8 marks)

Q5 (a) A group of bearings have a mean weight of 5.02 grams and a standard deviation of 0.30 grams. A random samples of 100 balls bearings chosen from this group, find the probability that an average weight of ball bearings chosen from this group are

(i) between 4.96 and 5.00 grams,

(ii) more than 5.10 grams.

(8 marks)

(b) A manufacturer of light bulbs claims that its light bulbs have a mean life of 700 hours and a standard deviation of 120 hours. Ayob purchased 144 of these bulbs and decided that he would purchase more if the mean life of his current sample exceeds 680 hours. What is the probability that he will purchase again from this manufacturer?

(5 marks)

(c) Syed Company manufacturer light bulbs where the life of the bulbs is approximately normal distributed. The CEO mentions that the average Syed light bulb last 300 days, with a standard deviation of fifty days. What is the probability that

(i) 15 randomly selected bulbs would have an average life not more than 290 days,

(ii) 20 randomly selected bulbs would have an average life between 280 to 290 days.

(12 marks)

Q6 (a) The weight of DEE student is normally distributed with mean and standard deviation 0.9. A random samples of 28 students was taken and the mean of the samples is 51.5 kg. Find

(i) the point estimator for mean,

(ii) 98% confidence interval for mean.

(7 marks)

(b) The usefulness of two different design languages in improving programming task has been studied. 40 expert programmers,, who familiar in both languages, are asked to code a standard function in both languages, and the time (in seconds) is recorded. For the Design Language 1, the mean time is 255s with standard deviation of 26s and for the design Language 2, the mean time is 319s with standard deviation of 17s.

(i) Construct a 96% confidence interval for the difference in mean coding times between Design Language 1 and Design Language 2?,

(ii) Construct a 95% confidence interval for the difference in mean coding times between Design Language 1 and Design Language 2?.

(10 marks)

(c) Given that 41 students and 44 professors took part in a study to find mean commuting distance. The mean number of miles traveled by students was 5.6 and the standard deviation was 2.8. The mean number of miles traveled by professors was 14.3 and the standard deviation was 9.1. Construct 99% confidence interval for the different between two mean numbers of miles traveled by professors and students. Interpret your result.

(8 marks)

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Formulae

Random Variable :

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

$$Var(X) = E(X^2) - [E(X)]^2.$$

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 :

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

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

Hypothesis Testings :

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

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

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$$v = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}}.$$

Simple Linear Regressions :

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

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

$$R^2 = 1 - \frac{\text{SSE}}{S_{yy}}.$$