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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2015/2016

COURSE NAME	:	STATISTICS
COURSE CODE	:	DAS 20502
PROGRAMME CODE	:	1 DAT / 2 DAE / 2 DAA / 2 DAM
EXAMINATION DATE	:	JUNE / JULY 2016
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTION	:	SECTION A) ANSWER ALL QUESTIONS
	:	SECTION B) ANSWER **THREE (3)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

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SECTION A

Q1 The yeild of a chemical process is said to be related to the operating temperature. To investigate this statement, an experiment was conducted and the following result are shown in **Table Q1**.

Table Q1

Temperature, x (C°)	145	155	160	175	180	160
Yeild, y (gm)	80	84	83	87	93	88

(a) Find S_{xx}, S_{yy} and S_{xy}.

(9 marks)

(b) Find and interpret the sample correlation coefficient, r.

(2 marks)

(c) Find $\hat{\beta}_1$ and $\hat{\beta}_0$

(4 marks)

(d) Find the estimated regression line, $\hat{y}$ and sketch this line.

(3 marks)

(e) Estimate value of $\hat{y}$ if $x = 171$.

(2 marks)

Q2 (a) Each packet of keropok must weigh 100g. Asiah randomly selected 60 packets and found that the mean weight is 110g and the standard deviation is 3.5g. Assume the population is distributed approximately normal. Test at 1% significance level whether the mean weight per packet is more than 100g.

(10 marks)

(b) The mean lifetime of 40 batteries produced by Company May is 65 hours and the mean lifetime of 55 batteries produced by Company Luz is 60 hours. If the standard deviation of all batteries produced by Company May is 3.5 hours and the standard deviation of all batteries produced Company Luz is 4 hours, test at 5% significance level that the mean lifetime of batteries produced by Company May is better than the mean lifetime of Company Luz. Assume the data was taken from a normal distribution.

(10 marks)

SECTION B

Q3 An investigation on the time of customers spent waiting to be connected to a customer service employee has been done. **Table Q3** shows the frequency table for 55 customers.

Class limit	f
1 – 5	9
6 – 10	3
11 – 15	19
16 – 20	14
21 – 25	6
26 – 30	4

Table Q3

(a) If x is the midpoint, construct a table that contains lower boundary, cumulative frequency, x, x^2, f_ix_i, $f_ix_i^2$, Σf, Σf_ix_i, $\Sigma f_ix_i^2$.

(6 marks)

(b) Find the

(i) Mean, Median and Mode

(10 marks)

(ii) Standard deviation

(4 marks)

Q4 (a) One fair coin is tossed by Kamal for three times.

(i) Draw the tree diagram.

(2 marks)

(ii) What is the probability getting of heads for the second tossed?

(2 marks)

(iii) Find the probability that there is no heads given that the first tossed is tails.

(3 marks)

(iv) Given that Kamal have observed at least one heads, what is the probability that Kamal observe at least two heads?

(3 marks)

(b)

$$g(y) = \begin{cases} y & 0 \le y < 1 \\ t(1 - \frac{1}{2}y) & 1 \le y \le 2 \\ 0 & \textit{Otherwise} \end{cases}$$

where t is a constant.

(i) Find the value of t.

(3 marks)

(ii) Find $P(y \le 0.5)$ and $P(-3 \le y \le 1.8)$

(4 marks)

(iii) Calculate the expected value

(3 marks)

Q5 (a) MayBank records show that credit card purchases for the month of August follow the normal distribution with an average of RM 1200 and a standard deviation of RM 550. Find the probability of

(i) the customers who spend more than RM 1500 in August by using their credit cards.

(5 marks)

(ii) the customers who spend between RM 1000 and RM 2000 inclusive in August by using their credit cards.

(5 marks)

(b) Statistics released by the National Highway Traffic Safety Administration show that on average 120 of all automobiles undergoing a headlight inspection with a standard deviation of 84 failed the inspection. What is the probability that

(i) at most 100 of the automobiles failed the inspection.

(5 marks)

(ii) between 130 and 145 of the automobiles failed the inspection.

(5 marks)

Q6 (a) The amount of time that a drive – through bank teller spends on a customer is a random variable with a mean $\mu = 3.2$ minutes and a standard deviation $\sigma = 1.6$ minutes.

(i) If a random sample of 64 customers is observed, find the probability that their mean time at the teller's counter is at most 2.7 minutes.

(5 marks)

(i) Find the probability that 25 randomly selected customers have their mean time more than 3.5 minutes.

(5 marks)

(b) The distribution of heights of a certain breed of terrier dogs has a mean height of 72 centimeters and a standard deviation of 10 centimeters, whereas the distribution of heights of a certain breed of poodles has a mean height of 28 centimeters with a standard deviation of 5 centimeters. Assume the populations are approximately normally distributed. Find the probability that the sample mean for a random sample of heights of 64 terrier dogs exceeds the sample mean for a random sample of heights of 100 poodles by at most 44.2 centimeters.

(10 marks)

Q7 (a) The data represent a sample of the number of home fires started by candles for the past several years. (Data are from the National Fire Protection Association). Find the 95% confidence interval for the mean number of home fires started by candles each year.

5460	5900	6090	6310	7160	8440	9930

(8 marks)

(b) Given those 40 primary school students and 45 secondary school students took part in a activity to find mean commuting distances. The mean number of miles traveled by primary school students was 7.9 and the standard deviation was 2.9. The mean number of miles traveled by secondary school students was 19.1 and the standard deviation was 7.1. Construct a 90% confidence interval for the difference between mean numbers of miles traveled by secondary school students to primary school students. Assume that the population variances are normally distributed.

(12 marks)

-END OF QUESTIONS –

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2015/2016 PROGRAMME : 1DAT,2DAA,2DAM,2DAE

COURSE : STATISTICS COURSE CODE : DAS 20502

Formula

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

$$r=\frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}},\quad \hat{\beta}_1=\frac{S_{xy}}{S_{xx}},\quad \hat{\beta}_0=\bar{y}-\hat{\beta}_1\bar{x},$$

$$Z=\frac{\bar{x}-\mu}{\sigma/\sqrt{n}},\ Z=\frac{\bar{x}-\mu}{s/\sqrt{n}},\quad T=\frac{\bar{x}-\mu}{s/\sqrt{n}}$$

$$Z=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}},\ Z=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}$$

$$\bar{x}=\frac{\sum f_i x_i}{\sum f_i},\ M=L_M+C\times\left(\frac{n/2-F}{f_m}\right),\ M_0=L+C\times\left(\frac{d_b}{d_b+d_a}\right)$$

$$s^2=\frac{1}{\Sigma f-1}\left[\sum_{i=1}^{n} f_i x_i^{\,2}-\frac{(\Sigma f_i x_i)^2}{\Sigma f}\right]$$

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

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

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

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

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

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

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

$$\bar{x} - t_{\alpha/2,v}\left(\frac{s}{\sqrt{n}}\right) < \mu < \bar{x} + t_{\alpha/2,v}\left(\frac{s}{\sqrt{n}}\right), \quad v = n-1.$$

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

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

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

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

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

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

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