UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	STATISTICS
COURSE CODE	:	BWM 11603
PROGRAMME	:	4 BIT
EXAMINATION DATE	:	JUNE 2013
DURATION	:	3 HOURS
INSTRUCTIONS	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) Soft drink is automatic filled into plastic cup by a dispenser machine. Quantity for every cup is normally distributed with mean 23 *ml* and its standard deviation is 3.6 *ml*. Find the probability that:

(i) Its quantity is less than 20 *ml*.
(ii) Its quantity is between 20 and 23 *ml*.
(iii) Its quantity is more than 25 *ml*.

(11 marks)

(b) In a bowling team, 10% are male members and the rest are female members. If two hundred bowling teams are randomly selected find the probability that ten or more are males. (9 marks)

Q2 (a) The president of the Statistics Society wishes to estimate the average age of the student presently enrolled in the Statistics class. Based on the past records, the population standard deviation is 2 years. A random sample of 50 students was selected and the mean is found to be 23.2 years. Construct the 95% confidence interval for the population mean.

(7 marks)

(b) A study was conducted to investigate the effects of physical training for the body builder. Sample data are listed below, with all weights given in kilograms.

Pre training : 99, 57, 62, 69, 74, 77, 59, 92, 70, 85
Post training : 94, 57, 62, 69, 66, 76, 58, 88, 70, 84, 83

Construct a 95% confidence interval for the difference between mean weights gained from the pre training and the post training by assuming both population variances are not equal.

(13 marks)

Q5 A rocket motor is manufactured by bonding together two types of propellants, an igniter and a sustainer. The shear strength of the bond y is thought to be linear function of the age of the propellant x when the motor is cast. Ten observations are shown in the following **Table Q5.**

Table Q5: Strength of bond y against age of propellant x

Observation Number	Strength, y (psi)	Age, x (weeks)
1	2158	15
2	1678	23
3	2316	8
4	2061	17
5	2207	5
6	1708	19
7	1784	24
8	2575	2
9	2357	7
10	2277	11

(a) Assuming a linear relationship, use the least squares method to find the simple linear regression model and interpret the meaning of β_1.

(14 marks)

(b) What is the approximate number of strength of bond if the age of propellant is 27?

(2 marks)

(c) Determine the value of Pearson correlation. Interpret the result.

(4 marks)

- END OF QUESTION -

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Formula

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 :

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

Estimations :

$n=\left(\dfrac{Z_{\alpha/2}\cdot\sigma}{E}\right)^2,\ \overline{x}\pm z_{\alpha/2}(\sigma/\sqrt{n}),\ \ \overline{x}\pm z_{\alpha/2}(s/\sqrt{n}),\ \overline{x}\pm t_{\alpha/2,v}\left(\dfrac{s}{\sqrt{n}}\right)$

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

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

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

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

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 $v=2(n-1)$,