UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE NAME	:	STATISTIC
COURSE CODE	:	BWM 11603/BSM 1413
PROGRAMME	:	BIT
EXAMINATION DATE	:	31 DECEMBER 2012
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

Q1 The following data is the burning times of chemical flares of two different formulations.

Type1		Type 2	
65	82	64	56
81	67	71	69
57	59	83	74
66	75	59	82
82	70	65	79

a) For each batch of data compute the mean, median and standard deviation.

(3 marks)

b) Calculate the coefficient of variation and compare them for the two types of formulation. Which set of data has more variable?

(3 marks)

c) Construct box plots for both data sets. Summarize your findings.

(4 marks)

Q2 A box contains three marbles (one blue, one red, one green). Two marbles are drawn with replacement. A second marble is then selected and its colour is observed. Let B denotes "blue", R denotes "red" and G denotes "green" marbles.

a) List the possible outcome (the elements in the sample space S).

(3 marks)

b) Let X be a random variable giving the number of "red" marbles. List the outcomes for the random variables X.

(3 marks)

c) Find the probability for each value of X.

(4 marks)

Q3 Let the probability density function of a random variable Y be

$$f(y) = \begin{cases} y & , \quad 0 < y < 1 \\ 2 - y & , \quad 1 \leq y < 2 \\ 0 & , \quad otherwise \end{cases}$$

a) Find $F(y)$.

(4 marks)

b) Find $P\ (0.5 \leq Y \leq 0.9)$

(3 marks)

c) Find $P\ (0.75 \leq Y \leq 1.5)$.

(3 marks)

Q4 The following is the probability distribution of the number of customers buying bicycle accessories at a particular shop in one day.

x	0	1	2	3	4	5	6
$P(X = x)$	0.05	0.10	0.15	0.25	0.30	0.10	0.05

a) Find the probability that the shop did not sell any bicycle accessory in one day.

(3 marks)

b) Find the probability that at least three customers bought from the shop in one day.

(3 marks)

c) Find the probability that at most five customers bought from the shop in one day.

(4 marks)

Q5 a) A lecturer gives his class a surprise four-question multiple-choice quiz. A student has not studied the material being quizzed and therefore decides to answer the four questions by randomly guessing the answers without reading the questions or the answers. Explain how this four-question quiz qualifies as a binomial experiment. What is the probability function?

(5 marks)

b) A box contains 5 red, 3 blue and 2 white balls. 3 balls are selected at random with replacement. The random variable X is the number of blue balls observed. Explain how this experiment qualifies as a binomial experiment. What is the probability function?

(5 marks)

Q6 The number of cars sold by a new car dealer follows a Poisson distribution with a mean of 13.5 cars sold in three days.

a) What is the probability that at least 6 cars are sold today?

(3 marks)

b) Find the mean and standard deviation of Y, the number of cars sold in two days. What is the probability that fewer than 10 cars are sold in two days?

(3 marks)

c) Find the mean and standard deviation of W, the number of cars sold in four days. What is the probability that at most 18 cars are sold in four days?

(4 marks)

Q7 The mean final examination scores for students taking SSM 2703 is 30 marks (out of 50 marks) with a standard deviation of 6 marks. Assume that the final examination scores are approximately normal. Two random samples were taken randomly consisting of 32 and 50 students, respectively. What is the probability that

a) The mean final examination scores will differ by more than 3 marks?

(5 marks)

b) Mean final examination scores from group 1 is larger than group 2?

(5 marks)

Q8 An experiment was conducted to compare two diets A and B designed for weight reduction. The group for diet A comprised of 10 overweight dieters while 9 overweight dieters for diet B were randomly selected. Their weight losses were recorded after a one month period. The results are as follows:

Diet A	**Diet B**
$\bar{X}_A = 21.3$	$\bar{X}_B = 13.4$
$S_A = 2.6$	$S_B = 1.9$

a) Construct a 90% confidence interval on the radio of the population variances.

(5 marks)

b) Construct a 95% confidence interval for the difference in the mean weight loss for the two diets.

(5 marks)

Q9 The mean lifetime of 30 bulbs produced by Company A is 50 hours and the mean lifetime of 35 bulbs produced by Company B is 48 hours. If the standard deviation of all bulbs produced by Company A is 3 hours and the standard deviation of all bulbs produced by Company B is 3.5 hours, test at 1% significance level at the mean lifetime of bulbs produced by Company A is better than that of Company B.

(10 marks)

Q10 The data in the table below are the circumference (in feet) and heights (in feet) of trees in a certain forest reserve.

Circumference,	1.8	1.9	1.8	2.4	5.1	3.1	5.5	5.1	8.3	13.7
Height,	21	33.5	24.6	40.7	73.2	24.9	40.4	45.3	53.5	93.9

a) Develop a model relating circumference to height of trees

(4 marks)

b) Interpret the meaning of the value of $\hat{\beta}$ in part **Q10 (a)**

(1 marks)

c) If a tree has a circumference of 4.0 feet, predict the height of the tree

(2 marks)

d) Is circumference related to height of trees? Conduct an appropriate test using $\alpha = 0.01$.

(3 marks)

- END OF QUESTION -

BWM 11603-STATISTIC

1. $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$

2. $\mu = \frac{\sum_{i=1}^{n} x_i}{N}$

3. $\bar{x} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}$

4. $M = L_m + C\left(\frac{\frac{n}{2} - F}{f_m}\right)$

5. $M_0 = L + C\left(\frac{d_1}{d_1 + d_2}\right)$

6. $\bar{D} = \frac{\sum_{i=1}^{n} |x_i - \bar{x}|}{n}$

7. $\bar{D} = \frac{1}{\sum_{i=1}^{n} f_i}\left(\sum_{i=1}^{n} f_i |x_i - \bar{x}|\right)$

8. $s^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}$

9. $\sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \mu)^2}{N}$

10. $Z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma^2{}_1}{n_1} + \frac{\sigma^2{}_2}{n_2}}}$

11. $\mu \pm Z_{\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right)$

12. $(\mu - \bar{X}) \pm Z_{\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right)$

13. $e = \pm z_{\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right)$ or $\pm z_{\frac{\alpha}{2}}\left(\frac{s}{\sqrt{n}}\right)$

14. $\bar{X} \pm t_{\frac{\alpha}{2}, n-1}\left(\frac{s}{\sqrt{n}}\right)$

15. $(\bar{X}_1 - \bar{X}_2) \pm Z_{\frac{\alpha}{2}}\sqrt{\frac{{\sigma_1}^2}{n_1} + \frac{{\sigma_2}^2}{n_2}}$

16. $(\bar{X}_1 - \bar{X}_2) \pm Z_{\frac{\alpha}{2}}\sqrt{\frac{{s_1}^2}{n_1} + \frac{{s_2}^2}{n_2}}$

17. $(\bar{X}_1 - \bar{X}_2) \pm Z_{\frac{\alpha}{2}} S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$ where

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

18. $(\bar{X}_1 - \bar{X}_2) \pm t_{\frac{\alpha}{2}, v}\sqrt{\frac{{s_1}^2}{n_1} + \frac{{s_1}^2}{n_1}}$ where

$$v = \frac{\left(\frac{{S_1}^2}{n_1} + \frac{{S_2}^2}{n_2}\right)^2}{\frac{\left(\frac{{S_1}^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{{S_2}^2}{n_2}\right)^2}{n_2 - 1}}$$

19. $(\bar{X}_1 - \bar{X}_2) \pm t_{\frac{\alpha}{2}, v} S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$ where ${S_p}^2 = \frac{(n_1 - 1){s_1}^2 + (n_2 - 1){s_2}^2}{n_1 + n_2 - 2}$ and $S_p = \sqrt{{S_p}^2}$

20. $\frac{(n-1)^2s^2}{\chi^2_{\frac{\alpha}{2},v}} < \sigma^2 < \frac{(n-1)^2s^2}{\chi^2_{1-\frac{\alpha}{2},v}}$

21. $\frac{s_1{}^2}{s_2{}^2}\frac{1}{f_{\frac{\alpha}{2}}(v_1,v_2)} < \frac{\sigma_1{}^2}{\sigma_2{}^2} < \frac{s_1{}^2}{s_2{}^2}f_{\frac{\alpha}{2}}(v_2,v_1)$

22. $\hat{\beta} = \frac{S_{xy}}{S_{xx}}$

23. $t = \frac{\hat{\beta}}{\sqrt{Var(\hat{\beta})}}$ where

$$Var(\hat{\beta}) = \left(\frac{S_{yy} - \hat{\beta}S_{xy}}{n-2}\right)\left(\frac{1}{S_{xx}}\right)$$