Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESI 2014/2015

COURSE NAME	:	CIVIL ENGINEERING STATISTICS
COURSE CODE	:	BFC 34303
PROGRAMME	:	BACHELOR OF CIVIL ENGINEERING WITH HONOURS
EXAMINATION DATE	:	JUNE 2015 / JULY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) The sample variance of a set of data with n=10 is $\frac{209}{90}$. If $\sum_{i=1}^{10} x_i^2$ is 65, find the sample mean.

(5 marks)

(b) The summary statistics of the length (in cm) of a sample of 50 adults insects of a certain species is as follows

$$\sum x = 45, \ \sum x^2 = 81.$$

Calculate the mean and variance.

(4 marks)

Q2 (a) Given two events A and B with $\mathrm{P}(B) = \frac{1}{3}$, $\mathrm{P}(A \cup B) = \frac{3}{4}$, $\mathrm{P}(B|A) = \frac{1}{4}$. Find

(i) $\mathrm{P}(A)$. (4 marks)

(ii) $\mathrm{P}(\overline{B}|\overline{A})$. (4 marks)

(b) The probabilities of two events A and B are such that $\mathrm{P}(A) = \frac{3}{4}$ and $\mathrm{P}(B) = \frac{2}{3}$

(i) If $\mathrm{P}(A \cup B) = \frac{11}{12}$, determine whether the events A and B are mutually exclusive, independent or neither. (5 marks)

(ii) If $\mathrm{P}(A \cup B) = \frac{5}{6}$, find $P(A \cap B')$. (2 marks)

Q3 The probability density function of a continuous random variable X is given by

$$f(x) = \begin{cases} kx^2 & , -1 < x < 2 \\ k & , 2 \le x < 4 \\ 0 & , \text{otherwise} \end{cases}$$

Where k is a positive constant

(a) Find k (4 marks)

(b) Determine, $F(x)$, the cumulative distribution function for X (9 marks)

Q4 (a) The marks in a mathematics examination are normally distributed with a mean of 65 and standard deviation of 10.

(i) If 40 is the pass mark, what is the probability that a student chosen at random passed this exam. (3 marks)

(ii) How many students obtain a grade A if the number of students that take the exam is 150 and the marks for grade A is 80 and above? (5 marks)

(iii) The examination board wishes 80 % of the students that took the exam to pass. What is the passing mark? (3 marks)

(b) The number of accidents that occur on a construction site has a Poisson distribution, where the mean number of accidents is 1.2 each month.

(i) Find the probability that 2 accidents occur in a month. (3 marks)

(ii) If the Department of Worker's Safety state that the number of accidents must not exceed three per month, what is the probability the construction site will defy the rule in any month? (2 marks)

Q5 The average time spent by engineering workers on weekends is 7.23 hours. Assume that the distribution is approximately normal with a standard deviation of 0.6 hour.

(i) Find the probability an individual who works that trade works fewer than seven hours on the weekend. (3 marks)

(ii) If a sample of 50 workers is randomly selected, find the probability the mean of the sample will be less than seven hours.

(4 marks)

Q6 A company claims that the mean of calcium oxide content of a certain brand of white cement is 130 kilograms. An experiment is conducted on the calcium oxide content of 30 batch of white cement of this brand. The data (in kilograms) gives mean of 131 and standard deviation of 0.9. At 5% significant level, is there enough evidence to reject the company claim?

(7 marks)

Q7 The effectiveness of advertising for two machine (Brand X and Brand Y) was compared. Market research was carried out with the participants being shown adverts for his two machine which they can rated on the overall likelihood of them buying the product (out of 10, with 10 being "definitely going to buy the product").

Brand X		Brand Y	
Participant	Rating	Participant	Rating
1	3	1	9
2	4	2	7
3	1	3	5
4	6	4	10
5	2	5	6
6	5	6	8

Test if there is any significance difference ($\alpha = 0.01$) between the rating given to each brand in terms of the likelihood of buying the product.

(8 marks)

Q8 The following table shows the results of the length $(y\ cm)$ of a metal rod measured at different temperature $(x\ ^{\circ}C)$.

Temperature, $x^{\circ}C$	105	111	115	121	126	130
Length, $y\ cm$	20.01	20.08	20.18	20.22	20.44	20.51

(a) Find the sample correlation coefficient. Explain what this value means in the context of the problem. (8 marks)

(b) Find the least square regression line to predict length from temperature. Interpret the regression coefficients in the context of the problem. (3 marks)

(c) Estimate the length of rod of 121°C. (2 marks)

(d) Find the sample coefficient of determination. Explain what this value represents in the context of the problem. (2 marks)

Q9 Table below shows the results of first test in Engineering Statistics for three different groups.

Group A	Group B	Group C
7	3	1
8	6	2
12	3	1
6	2	3
8	5	-

Can we conclude that there are differences in mean of results among this three groups? Use $\alpha = 0.01$.

(10 marks)

-END OF QUESTION-