INTI INTERNATIONAL UNIVERSITY

FOUNDATION IN SCIENCE (CFSI)
STA1202: STATISTICS
FINAL EXAMINATION: JANUARY 2016 SESSION

Instructions: This paper consists of **SIX (6)** questions. Answer any **FIVE (5)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Concrete blocks are tested and it is found that, on average, 7% fail to meet the required specifications. For a batch of 9 blocks, determine the probabilities that

(i) exactly three blocks will fail to meet the specifications.

(2 marks)

(ii) less than four blocks will fail to meet the specifications.

(3 marks)

(b) 500 tins of paint have a mean content of 1010 ml and a standard deviation is 8.7 ml. Assuming that the volumes of the contents are normally distributed, calculate the number of tins likely to have contents whose volumes are

(i) less than 1025 ml

(4 marks)

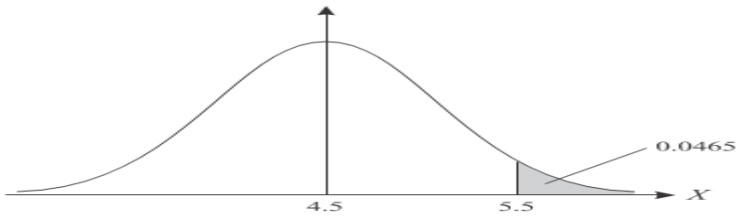
(ii) less than 1000 ml and

(4 marks)

(iii) more than 995 ml.

(4 marks)

(c) The random variable X has a normal distribution with mean 4.5. It is given that $P(X > 5.5) = 0.0465$ (see diagram). Find the standard deviation of X. Give the answer in four decimal points.



(3 marks)

Question 2

(a) When packing a product, a manufacturer finds that one packet in twenty is underweight. Determine the probabilities that in a box of 72 packets

(i) exactly two will be underweight.

(2 marks)

(ii) less than four will be underweight.

(4 marks)

(b) An amplifier is made up of three transistors A, B and C. The probabilities of A, B and C being defective are $\frac{1}{20}$, $\frac{1}{25}$ and $\frac{1}{50}$, respectively. Calculate the probability an amplifier produced

(i) works satisfactorily.

(2 marks)

(ii) has only one defective transistor.

(2 marks)

(c) A batch of 1-kilowatt fire elements contain 16 elements which are within a power tolerance and 4 elements which are not power tolerance. If 3 elements are selected at random from the batch, calculate the probabilities that

(i) all three are within the power tolerance.

(2 marks)

(ii) exactly two are within the power tolerance.

(2 marks)

(d) The probability that component A will operate satisfactorily for 5 years is 0.8 and that component B will operate satisfactorily over the same period of time is 0.75. Find the probabilities that in a 5 year period:

(i) both components operate satisfactorily.

(2 marks)

(ii) only component A will operate satisfactorily.

(2 marks)

(iii) only component B will operate satisfactorily.

(2 marks)

Question 3

The diameter in millimeters of a reel of wire is measured in 48 places and the results are shown in the table below:

2.10	2.29	2.32	2.21	2.14	2.22	2.28	2.18	2.17	2.20	2.23	2.13
2.26	2.10	2.21	2.17	2.28	2.15	2.16	2.25	2.23	2.11	2.27	2.34
2.24	2.05	2.29	2.18	2.24	2.16	2.15	2.22	2.14	2.27	2.09	2.21
2.11	2.17	2.22	2.19	2.12	2.30	2.23	2.07	2.13	2.26	2.16	2.12

(a) Construct a frequency distribution with class size of 0.05, using 2.05 as the lower boundary of the first class.

(2 marks)

(b) Find the mean of the data.

(3 marks)

(c) Find the median of the data using formula.

(4 marks)

(d) Find the mode of the data using formula.

(4 marks)

(e) Find the variance of the data using formula.

(4 marks)

(f) Draw a histogram for the above data.

(3 marks)

Question 4

(a) Given that $S = \{1,\ 2,\ 3,\ 4,\ 5\}$, $W = \{1,\ 3,\ 5\}$, and $J = \{2,\ 4\}$.

(i) Are the events *W* and *J* mutually exclusive? Explain.

(2 marks)

(ii) Are the events *W* and *J* exhaustive? Explain.

(2 marks)

(b) The data below shows the grades of STA1202 obtained by 30 students.

A+	**B+**	**B**	**C**	**A-**	**A-**	**B+**	**B+**	**B+**	**B-**	**B-**	**C+**	**C**	**B**	**B**
A-	**B-**	**C+**	**A+**	**A-**	**B+**	**B+**	**B+**	**B+**	**B-**	**C+**	**C+**	**B**	**B**	**B**

Using a scale of 2 cm to 1 student on the horizontal axis and 2 cm to 1 grade on the vertical axis, draw a bar chat to represent the distribution.

(4 marks)

(c) The discrete random variable *X* has the following probability distribution. Given that $E(X) = 2.77$.

X	0	1	2	3	4	5
$P(X = x)$	0	a	0.3	0.4	0.03	b

Find the values of

(i) a and b.

(5 marks)

(ii) $E(X^2)$.

(2 marks)

(iii) standard deviation of X.

(2 marks)

(iv) $P(X > 2)$.

(1 mark)

(v) Find $E(4X + 5)$.

(2 marks)

Question 5

(a) Miss Soong buys yoga balls from 3 different companies A, B and C. She buys 45% of the yoga balls from company A, 35% from company B and 20% from company C. The percentages of defective balls supplied by company A, company B and company C are 2% , 3% and 5% respectively.

(i) If a yoga ball is selected at random, what is the probability that it is defective?

(2 marks)

(ii) If Miss Soong finds that a yoga ball is defective, what is the probability that the yoga ball is supplied by company C?

(2 marks)

(b) A survey was conducted on a sample of 50 customers who visited IOI City Mall and purchased products from there. The table below shows that some of them visited the IOI City Mall because they have read the advertisement in the newspaper while others did not.

	Read newspaper	Did not read newspaper
Purchased	20	8
Did not purchase	10	12

A customer is randomly selected from the respondents, find the probability that the customer

(i) did not make a purchase.

(2 marks)

(ii) made a purchase if the customer read the advertisement in the newspaper.

(2 marks)

(iii) read the advertisement in the newspaper given that he did not make a purchase.

(2 marks)

(iv) did not read the advertisement or did not make a purchase.

(2 marks)

(c) If $X \sim Bin(88,0.1)$, find

(i) $E(X)$.

(2 marks)

(ii) $Var(X)$.

(2 marks)

(d) The random variable $X \sim N(60, 50)$. Find

(i) $P(X < 70)$.

(2 marks)

(ii) $P(X > 135)$.

(2 marks)

Question 6

(a) The following data shows the heights of 100 people measured correct to the nearest centimeter.

Height	Frequency
150 – 157	5
158 – 165	18
166 – 173	42
174 – 181	27
182 – 189	8

(i) Draw a cumulative frequency graph and estimate the median graphically.

(5 marks)

(ii) Draw a histogram and estimate the mode graphically.

(5 marks)

(b) X is a random variable with Poisson probability distribution. Find

(i) $P(X = 2)$ when $\lambda = 5$.

(2 marks)

(ii) $P(2 < X < 5)$ when $\lambda = 5$.

(2 marks)

(c) Given a set of numbers $\{12, 18, 13, 10, 6, 23, 16, 14, 14\}$.

(i) Find the mean of the data.

(2 marks)

(ii) Find the median of the data using formula.

(1 mark)

(iii) Find the standard deviation of the data.

(3 marks)

--THE END--