



MURANG'A UNIVERSITY COLLEGE

A constituent college of Jomo Kenyatta University of Agriculture and Technology

University Examination 2014/2015

**END OF SEMESTER SUPPLEMENTARY/SPECIAL EXAMINATION FOR THE
DIPLOMA IN ELECTRICAL ENGINEERING**

SEE 1201: ENGINEERING MATHEMATICS III

DATE: AUGUST 2015

TIME: 2 HOURS

Instructions: Attempt question **One** and **Two** other questions

Question 1 (20 marks)

- a) Define the following terms as used in probability and statistics
- (i) Mutually exclusive events [1mark]
 - (ii) Independent events [1mark]
 - (iii) Correlation Coefficient [1marks]
 - (iv) Type I and Type II errors [2marks]
- b) When 200 marks were recorded the mean was 60 and the standard deviation 15. Later it was discovered that a mark originally recorded as 73 should have been recorded as 63. Find the correct mean. [4marks]

- c) The age distribution of 70 workers in a factory is given below.

Ages (years)	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55
Frequency	2	10	12	X	10	8	2	3

- (i) Find the value of X. [2 marks]
 - (ii) Calculate the mode and median of the above data [6 marks]
- d) An experiment into the correlation between the two variables x and y produced the following data:

X	13.0	16.0	19.0	22.0	28.0	25.0
Y	37.5	36.8	40.2	41.7	39.3	43.0

Calculate the spearman's coefficient of rank correlation coefficient between x and y [4marks]

- e) Mr Hassan has two gardeners Obote and Kamuri. Obote comes on a $\frac{1}{3}$ of the occasions and Kamuri $\frac{2}{3}$ of the occasions. There is a probability of $\frac{1}{10}$ that Obote will forget to water the flowers and probability of $\frac{1}{2}$ that Kamuri will forget to water the flowers. One day Mr Hassan has to leave the house before the

gardener arrives. On his return he finds that the gardener has come and gone, and also that the flowers are not watered. What is the probability that Kamuri came that day?.

[5marks]

- f) The mean life of a sample of 400 vehicle spare parts produced by a company is found to be 1580 days with a standard deviation of 80 days. Test the hypothesis that the mean life time of the spare parts is 1500 days at 5% level of significance

[4marks]

Question 2 (20 marks)

Ten students sat for two physics tests, one practical and the other theoretical. Their marks out of 10 are recorded in the table below

Practical Test(X)	8	6	10	5	6	8	10	7	7	8
Theoretical Test (Y)	6	7	8	7	4	9	10	5	8	6

- (a) Draw a scatter plot of the pair of marks and state the relationship suggested by the plot [4 marks]
- (b) Calculate the Pearson's product moment correlation coefficient and comment on your result [7 marks]
- (c) A student was absent from the theoretical test but obtained a mark of 6 in practical test. Use appropriate regression line to estimate her mark in the theoretical test. [7 marks]
- (d) A student missed a practical test but obtained a mark of 3 in the theoretical test. Estimate his mark in the practical test. [2 marks]

Question 3 (20 marks)

- (a) Given the data below

Marks	20-29	30-39	40-49	50-59	60-69	70-79
Number of students	5	20	12	10	8	5

Compute

- (i) the mean using assumed mean method (Take $A = 44.5$) [4 marks]
- (ii) the standard deviation using assumed mean method using A of part (i). [6 marks]
- (iii) the median [3 marks]
- (iv) the first and third quartiles and hence find the quartile deviation [5 marks]
- (v) the quartile coefficient of skewness [2 marks]

Question 5 (20 marks)

a) A and B are two identical boxes. Box A contains 1 diamond ring and 3 gold rings. Box B contains 3 diamond rings and 3 gold rings. A box is chosen from random, and from it a ring is drawn at random and then put into the other box. A ring is then drawn from this latter box.

Required.

Illustrate the information given in a probability tree diagram. Hence determine

[6marks]

(i) The probability that both rings drawn are diamond rings, [3marks]

(ii) The probability that the first ring drawn is a gold ring, [2marks]

(iii) The probability that the first ring drawn is a diamond ring, given that the second ring drawn is gold ring. [4marks]

b) Tuskys supermarket receives bulk orders of packets of chickens wings of nominal mass 500g from Bidii Butcheries. From past experience the masses of the packets have a distribution which is normal with standard deviation 15 grams. One day a sample of 16 packets is taken from the batch and found to have a mean mass of 495 grams. Are there grounds for the management at Tuskys to complain that the packets are below the claimed mass of 500 grams at 5% significance level.

[5marks]

Question 5 (20 marks)

a) Describe two types of errors associated with hypothesis testing [4marks]

b) The discrete random variable X has the probability distribution shown below.

X	P(X)
0	0.1
1	a
2	b
3	c

If $P(X \leq 1) = 0.3$ and $E[X] = 1.7$, determine the values of a, b and c [8marks]

c) If X is a random variable with a and b being arbitrary constants, show that $var(ax + b) = a^2 var(x)$ [3marks]

d) a random variable X is defined to have a poisson distribution with p.m.f

$$f(x) = \begin{cases} \frac{e^{-\lambda} \lambda^x}{x!} & \text{for } x = 0, 1, 2, \dots \\ 0, & \text{otherwise} \end{cases}$$

Determine the mean

[5marks]