TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF MEDICAL ENGINEERING

DIPLOMA IN MEDICAL ENGINEERING (Y2 S2)

AMA 2251: ENGINEERING MATHEMATICS IV

END OF SEMESTER EXAMINATION
SERIES: APRIL 2014
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination

- *Answer booklet*

This paper consists of **FIVE** questions. Answer question **ONE (compulsory)** and any other **TWO** questions

Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) The data given below refer to the gain of each of a batch of 40 transistors, expressed correct to the nearest whole number:

81	83	87	74	76	89	82	84
86	76	77	71	86	85	87	88
84	81	80	81	73	89	82	79
81	79	78	80	85	77	84	78
83	79	80	83	82	79	80	77

I) Classify the data using 7 classes **(6 marks)**

II) Using the classified data in (a) above calculate:

(i) The median

(ii) The mean

(iii) The standard deviation **(14 marks)**

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

(i) Three blocks and;

(ii) Less than four blocks will fail to meet to specification **(10 marks)**

Question Two

a) A machine produces 15% defective components. In a sample of 5, drawn at random, calculate using the binomial distribution the probability that:

(i) There will be 4 defective items

(ii) There will be not more than 3 defective items

(iii) All the items will be non-defective **(14 marks)**

b) Determine the probability of:

(i) Winning a price in a raffle of buying 6 tickets when a total of 480 tickets are sold

(ii) Selecting at random a female from a group of 12 boys and 28 girls

(iii) Winning a price in a raffle of buying 8 tickets when there are 5 prizes and a total of 800 tickets are sold **(6 marks)**

Question Three

a) 2% of the light bulbs produced by a company are defective. Determine, using the poisson distribution, the probability that in a sample of 80 bulbs:

(i) 3 bulbs will be defective

(ii) Not more than 3 bulbs will be defective

(iii) At least 2 bulbs will be defective **(13 marks)**

b) A company produces Five products in the following proportions:

Product A 24

Product B	16
Product C	15
Product D	11
Product E	6

Present these data visually by drawing:

(i) A pie diagram
(ii) A percentage bar chart **(7 marks)**

Question Four

a) Some engineering components have a mean length of 20mm and a standard deviation of 0.25mm. Assume that the data on the lengths of the components is normally distributed. In a batch of 500 components, determine the number of components likely to:
(i) Have a length of less than 19.95mm
(ii) Be between 19.95mm and 20.15mm
(iii) Be longer than 20.54mm **(12 marks)**

b) In a box containing 120 similar transistors, 70 are satisfactory 37 give too high again under normal operating conditions and the remainder give too low a gain. Calculate the probability that when drawing two transistors in turn, at random, with replacement of having:
(i) Two satisfactory
(ii) None with low gain
(iii) One with high gain and one satisfactory
(iv) One with low gain and none satisfactory **(8 marks)**

Question Five

a) The masses of 50 ingots in kilograms are measured correct to the nearest 0.1kg and the results are as shown below. Produce a frequency distribution having 7 classes for these data:**(6 marks)**

8.0	8.6	8.2	7.5	8.0	9.1	8.5	7.6	8.2	7.8
8.3	7.1	8.1	8.3	8.7	7.8	8.7	8.5	8.4	8.5
7.7	8.4	7.9	8.8	7.2	8.1	7.8	8.2	7.7	7.5
8.1	7.4	8.8	8.0	8.4	8.5	8.1	7.3	9.0	8.6
7.4	8.2	8.4	7.7	8.3	8.2	7.9	8.5	7.9	8.0

b) For the above data draw:
(i) Histogram
(ii) Frequency polygon
(iii) Ogive **(14 marks)**