TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

**BACHELOR OF TECHNOLOGY IN INFORAMTION TECHNOLOGY
(BTIT 13S – PT)**

AMA 4203: STATISTICS

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

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
- *Mathematical tables*
- *Scientific Calculator*

This paper consist 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) Define the following terms as used in probability and statistics:

   (i) Variable   **(1 mark)**

   (ii) Class interval   **(1 mark)**

   (iii) Mutually exclusive events   **(1 mark)**

b) Determine the probability of having at least one girl and one boy in a family of 4 children assuming equal probability of male and female birth.   **(6 marks)**

c) Determine the value of C so that the following function can serve as a probability mass function:

$$f(x) = C\binom{2}{x}\binom{3}{3-x}, \quad x = 0,1,2$$

(4 marks)

$$f(x) = \begin{cases} k\left(x - x^2\right) & 0 \le x \le 1 \\ 0 & elsewhere \end{cases}$$

d) Let X be random variable with pdf K, constant. Find
   (i) The value of K **(3 marks)**
   (ii) The mean **(3 marks)**
   (iii) Mode **(3 marks)**

e) A piece of equipment will function when all 3 components A, B and C are working. The probability of A failing during one year is 0.15, that of B failing is 0.05 and that of C failing is 0.10. If the components work independently, determine the probability of;
   (i) The equipment failing before the end of the year **(6 marks)**
   (ii) The equipment failing due to component A **(2 marks)**

Question Two

a) In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total output. It is known that in their output 5%, 4% and 2% respectively are defective bolts. A bolt is drawn at random from the production line and is found to be defective. Determine the probability that it was manufactured by:
   (i) Machine A **(4 marks)**
   (ii) Machine B **(3 marks)**
   (iii) Machine C **(3 marks)**

b) Contamination is a problem in manufacture of optical storage disks. The number of particles of contamination that occur on an optical disk has a Poisson distribution and the average number of particles per cm^2 of media surface is 0.1. The area of disk under study is $100cm^2$. Find the probability that:
   (i) 12 particles occur in the area under study **(3 marks)**
   (ii) No particle is found in the area under study **(2 marks)**
   (iii) 3 or fewer particles occur in the area under study **(5 marks)**

Question Three

a) The quality control department of a wire manufacturing company periodically selects a sample of wire specimens to test for breaking strength. Past records shown that the breaking strengths of a certain type of wire are normally distributed with a standard deviation of $\sigma = 200$ kgf. If a sample of 50 wires had a mean breaking strength of 2500kgf, find the 95% confidence interval for the population mean. **(4 marks)**

b) The mean lifetime of a sample of 100 light tubes produced by a company is found to be 1570 hours with a standard deviation of 80 hours. Test a 5% level, the hypothesis that the mean life time of the tubes produced by the company is 1600 hours. **(5 marks)**

c) The mean diameter of a sample of 200 washers produced by a machine is 5.02mm and variance is 0.05mm. The purpose for which the washers are produced allows a maximum tolerance in diameter of 4.96 to 5.08mm otherwise they are considered defective. Determine the percentage defective washers produced by the machine assuming a normal distribution for the diameter. **(6 marks)**

d) Two students received standard stores of 0.8 and -0.4 respectively in an examination. if their marks were 88 and 64 respectively, find the mean and standard deviation of the examination. **(5 marks)**

Question Four

In an experiment to measure the relationship between the power consumed by a motor (watts) and its noise output (decibels); the following data were collected:

Power consumed (watts)	3	5	6	9	10	12	15	20	22	28
Noise output (db)	10	12	15	18	20	22	27	30	32	34

a) Find the correlation coefficient between the power consumed and noise output and comment on it. **(10 marks)**

b) Find the regression equation of noise on power consumed and use it to approximate the noise level when 25 watts of power are consumed. **(10 marks)**

Question Five

The following frequency distribution shows the number of computers bought by 60 private schools in Nairobi:

Number of computers bought	40 – 44	45 – 49	50 – 54	55 – 59	60 – 64
Number of Schools	6	10	25	11	8

a) Draw a histogram to represent the data. **(4 marks)**
b) Determine the following for the data:
   (i)   The mean **(4 marks)**
   (ii) The standard deviation **(4 marks)**
   (iii) The median the computers bought **(3 marks)**
   (iv) The interquartile range **(5 marks)**