MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.
Tel: 020-2069349, 061-2309217. 064-30320 Cell phone: +254 712524293, +254 789151411
Fax: 064-30321
Website: www.must.ac.ke Email: info@mucst.ac.ke

University Examinations 2012/2013

FIRST YEAR, FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND BACHELOR OF SCIENCE IN PUBLIC HEALTH

SMA 2104: MATHEMATICS FOR SCIENCES

DATE: AUGUST 2013 **TIME: 2 HOURS**

INSTRUCTIONS: *Answer question **one** and any other **two** questions*

QUESTION ONE (30 MARKS)

a) Find the value of a and b if the expression $2x^3 - 15x^2 + ax + b$ is divisible by $(x - 4)$ and by $(2x - 1)$. (3 Marks)

b) Find the sum of the first n terms of the sequence $\left\{\frac{1}{2}, \frac{1}{4}, \frac{1}{8} \ldots .\right\}$ (2 Marks)

c) How many three digit numbers can be made from the integers 1,2,3,4,5,6 if
   i. Each integer is used only once. (2 Marks)
   ii. There is no restriction on the number of times each integer can be used. (2 Marks)

d) Find the exact value of $\log_3 {}^{1}/_{27}$. (2 Marks)

e) Solve the equation $2\cos^2\theta - \sin\theta = 0 \; where \; 0 \leq \theta \leq 2\pi$. (3 Marks)

f) Simplify without using tables, or calculators the value of $\frac{1}{\sqrt{2}-3} + \frac{1}{\sqrt{2}+3}$. (3 Marks)

g) Write down and simplify the coefficient of the term indicated in the expansion of the term in x^5 in expansion of $\left(3 + \frac{1}{3}x\right)^{11}$. (3 Marks)

h) A student assessment consists of three tests of which he must pass at least two to continue with the course. He estimates that the probabilities of passing the tests are 0.7, 0.8, 0.9 respectively. calculate the probability that he will stay in the course.(3 Marks)

i) The data below gives the money (in dollars) spent by customers at supermarket.
88 69 141 28 106 45 32 51 78 54

Find the

i. Arithmetic mean (1 Mark)
ii. Median (2 Marks)
iii. Standard deviation (2 Marks)

QUESTION TWO (20 MARKS)

a) A formulae for finding the durability of a fibre is $ak^2 + 2b(k - c) = 0$. Solve the equation for k when a = 16, b = 40 and c = 8. (4 Marks)

b) Draw the graph of the function $f(x) = x^2 - 3x + 2\ for - 1 \leq x \leq 4$. (3 Marks)
From the graph find the roots of the equations:

i. $x^2 - 3x + 2 = 0$ (2 Marks)
ii. $x^2 - 4x = 0$ (4 Marks)

c) Use the method of completing the square to find the roots of the quadratic equation $3x^2 - 4x - 5 = 0$. (3 Marks)

d) Given that $\log_2 x + 2\log_4 y = 4$, show that xy=16, hence solve for x and y given that

i. $\log_{10}(x + y) = 1$
ii. $\log_2 x + 2\log_4 y = 4$ (4 Marks)

QUESTION THREE (20 MARKS)

a) State a data collection method, hence state its one advantage and one disadvantage. (2 Marks)

b) The table below shows the marks out of 50, obtained in an examination by 80 students.

Marks	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40
frequency	4	7	11	18	22	10	5	3

Using the data, calculate:

i. Arithmetic mean (2 Marks)
ii. Median (2 Marks)
iii. Plot a cumulative frequency polygon (ogive) (3 Marks)

c) Two planes leave airport L at 12noon. The first plane flies due west at a speed of 600km/hr and the second plane flies on a bearing of N30°E at a speed of 100km/hr. Find:

i. Distance between two planes at 1.00pm (3 Marks)
ii. The bearing of the second plane from the first plane at that time. (4 Marks)

d) John deposited ksh. 100 in a saving bank on his son's 1st birthday, kshs. 1200 on his second , kshs. 1,400 on his 3rd and so on increasing the amounts by ksh.200 on each birthday. How much will be saved up this way by the time the boy reaches his 20th birthday, the latter inclusive. (4 Marks)

QUESTION FOUR (20 MARKS)

a) The probability that Ken goes to Nakuru is ¼ if he goes to Nakuru, the probability that he will see a flamingo is ½. If he does not go to Nakuru, the probability that he will see a flamingo is $\frac{1}{3}$. Use a tree diagram to find the probability that Ken will,

i. Go to Nakuru and see a flamingo. (2 Marks)

ii. Not go to Nakuru and yet see a flamingo. (2 Marks)

iii. See a flamingo. (2 Marks)

b) Factorize the expression $6x^3 - 17x^2 - 4x + 3$. Hence solve the cubic equation $6x^3 - 17x^2 - 4x + 3 = 0$. (5 Marks)

c) Write down the first three terms in the expansion in ascending powers of x of $(3 - 2x)^8$, hence evaluate $(2.98)^8$ correct to 3 decimal places. (5 Marks)

d) The area of a field is in the form of a quadrilateral ABCD shown below. Determine its area. (4 Marks)