TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY (BSIT)

AMA 4104: FOUNDATIONS OF MATHEMATICS

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
TIME ALLOWED: 2 HOURS

Question One (Compulsory)

a) Simplify:
$$16^{n/2} \times 2^{2n+2} \div 8^{-n\sqrt{3}}$$
(3 marks)

b) Evaluate:
$$\frac{\log_a 32 - \log_a 4 + \log_a 8}{\log_a 256}$$
(3 marks)

c) Given that set $A = \{1,2,3,4\}$ $B = \{3,4,5,6,7\}$ Determine :

(i) $A \cup B$

(ii) $A \cap B$

(iii) A / B **(3 marks)**

d) Determine the smallest number of terms of the G.P 8 + 24 + 72 + …. that will give a total greater than 6,000,000 **(3 marks)**

e) If $\cos ec\theta = \sqrt{2}$, find the value for $\dfrac{\sec^2 \theta - \cos ec^2\theta}{\tan^2 \theta - \cos^2 \theta}$ **(3 marks)**

f) Evaluate: $\dfrac{2-i}{3ti}$ **(3 marks)**

g) Differential $y = \dfrac{3x}{x^2 - 1}$ using quotient rule **(3 marks)**

h) A bag contains 5 black balls, 3 green balls and 2 white balls. A ball is picked from bag and not replaced. Find the probability of obtaining a black, green and white in that order in three draws.

(3 marks)

i) The heights of thirty students in a class are recorded as follows:

120	125	125	127	127	148
100	104	116	102	116	103
112	108	110	126	152	101
150	152	150	121	128	151
128	133	112	140	140	142

(i) Construct a frequency table with class interval of 5cm beginning with 99cm **(3 marks)**

(ii) Draw a histogram of the data. **(3 marks)**

Question Two

a) The sides of a triangle are 12cm, 9cm and 8cm long. Calculate the area of the triangle. **(3 marks)**

b) Given $a = 3i + 4j$, $b = 2i + 5j + 4k$ and $a = 5i - j + 2k$ Find $\left| 2a - 3b + c \right|$ **(4 marks)**

c) Find the value of arg z when $z = \dfrac{-2}{1 + i\sqrt{3}}$ **(4 marks)**

d) Express as a single fraction:

$$\frac{4}{x+1} + \frac{x}{1+x} - 3$$

(3 marks)

$$f(x) = 2x^2$$

e) Differentiate from first principles **(6 marks)**

Question Three

a) Define the following events as used in probability:
    (i) Dependent events **(2 marks)**
    (ii) Independent events **(2 marks)**
    (iii) Mutually exclusive events **(2 marks)**

b) A man estimates that the probability of his surviving for the next 20 years is 0.30, but the probability that his wife will be alive after 20 years is 0.20. Determine the probability that after 20 years.
    (i) Both man and wife will be alive **(2 marks)**
    (ii) Neither will be a live **(2 marks)**
    (iii) Only the wife will be alive **(2 marks)**
    (iv) Only the man will be alive **(2 marks)**

c) Differentiate the following with respect to x:

$$y = \frac{1}{\sqrt[3]{x}} - \frac{1}{\sqrt{x}} + x^2$$

    (i) **(3 marks)**

$$y = \frac{9}{x^2} + \frac{b}{x} + c$$

    (ii) **(3 marks)**

Question Four

a) Define the terms mean and standard deviation as used in statistics. **(2 marks)**

b) Tests on 100 specimen wood cubes gave the following results for densities in kilograms per cubic metre. A ship rounds a

Density in kg/m^3	Frequency
400-449	2
450-499	3
500-549	10
550-599	21
600-649	30
650-699	15
700-749	9
750-799	6
800-849	3
850-799	1

Calculate the mean and the standard deviation for this distribution **(10 marks)**

$$A = \frac{5}{13} \qquad B = \frac{7}{25}$$

c) If sin $\qquad$ and cos $\qquad$ and A, B are acute angles, calculate without using tables or calculators.

    (i) tan A cos B   **(3 marks)**
    (ii) cos (90 – A) sin (90 – B)   **(3 marks)**
    (iii) Cosec^2 A sec2 B   **(2 marks)**

Question Five

a) Express 12 – 15 in polar form and hence evaluate $(12-15)^3$ **(4 marks)**

b) The following results were obtained after measuring the velocity of a body at various times:

Velocity v(m/s)	7.8	10.6	13.4	15.6	16.4	20.6	23
Time t(s)	1.1	2.1	3.1	4.1	5.1	6.1	7.1

    (i) Plot a graph of velocity V (m/s) against time t(s)   **(5 marks)**
    (ii) Verity that the values obey the law V = u + at and hence approximate the values of u and a
                                                                       (4 marks)
c) A vehicle manufacturer recorded the following figures for the production of cars for the years 1978 to 1984. Use 1980 as the base year to compute the quantity index.   **(7 marks)**

Year	1978	1979	1980	1981	1982	1983	1984
No. of cars assembled	4500	4000	5000	5800	6200	6900	8000