THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)
(A Centre of Excellence)

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:
BACHELOR OF TECHNOLOGY IN INFORMATION COMMUNICATION TECHNOLOGY

AMA 4104: FOUNDATION MATHEMATICS

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2012
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consist of **FIVE** questions in **TWO** sections **A** & **B**
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) Prove that
$$\frac{1+\cot\theta}{1+\tan\theta} = \cot\theta$$
(4 marks)

b) Differentiate $f(x) = 6x^2 - 3x + 5$ and find the gradient of the curve at $x = 2$ **(4 marks)**

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c) A Germany Silver alloy consists of 60% copper, 25% of zinc and 15% of nickel. Determine the masses of copper, zinc and nickel in a 3.74kg block of the alloy. **(3 marks)**

d) Simplify $\dfrac{P^{\frac{1}{2}}q^{2}r^{\frac{2}{3}}}{p^{\frac{1}{4}}q^{\frac{1}{2}}r^{\frac{1}{6}}}$ and evaluate when p = 16, q = 9 and r = 4, taking positive roots only. **(5 marks)**

e) Solve the equation:
$$\tfrac{1}{2}(x-3) - \tfrac{1}{3}(x-2) = \tfrac{7}{6}$$

(3 marks)

f) The height of the pupils in a class were measured to the nearest centimeters and recorded as below:

175	154	157	180	165	150	152	162
173	168	169	181	177	179	175	169
151	153	156	158	163	169	179	180
145	149	150	156	171	175	176	178
169	160	155	174	170	176	182	170

    (i)   Using a class interval of 5 make a grouped frequency table. **(4 marks)**
    (ii)   Estimate the mean and the median of the height of the class. **(4 marks)**
    (iii)   Draw a frequency polygon to represent the information above. **(3 marks)**

Question Two

a) Find the derivative of $y = 4x^{2} + 5x - 2$ using first principle. **(7 marks)**

b) Differentiate $y = (2x^{2} + 4)(x + 3)$ **(5 marks)**

c) Find the rate per annum at which a certain amount of money doubles after being invested for a period of 5 years compounded annually. **(4 marks)**

d) Solve the indicial equation for x. **(4 marks)**
$$2^{x-1} = 3^{2x-1}$$

Question Three

a) The periodic time T, of oscillation of a pendulum is believed to be related to its length, C by a law of the form $T = kC^{n}$, where k and n are constants. Values of T are measured for various lengths of the pendulum and the results are as shown below:

Periodic Time, T(sec)	1	1.3	1.5	1.8	2	2.3
Length (cm)	0.25	0.42	0.56	0.81	1	1.32

(i) Show that the law is true by reducing it to linear form. **(3 marks)**
(ii) Draw the graph and hence determine the value of k and n. **(7 marks)**
(iii) Determine the law of the graph and hence find T when C = 0.75M **(3 marks)**

b) Solve the simultaneous equation. **(3 marks)**

$$5x - 8y = 2$$
$$7x + 3y = 17$$

c) Evaluate:

$$\frac{\log 25 - \log 125 + \frac{1}{2}\log 625}{3\log 5}$$

(4 marks)

Question Four

a) A bag contains 7 white, 6 red and 5 black balls:
(i) A ball is drawn at random from the bag. Find the probability that it is red. **(2 marks)**
(ii) Three balls are drawn from the bag one at a time without replacement. Find the probability that:
   a) They are of the same colour. **(3 marks)**
   b) At least 2 are white. **(5 marks)**
   c) At most 2 are black. **(5 marks)**

b) The total surface area of a closed cylindrical can is 125cm². Calculate the radius of the cylinder if its height is 5.24cm for a closed cylinder having radius r and height h. **(5 marks)**

Question Five

a) A researcher collected the following data on the marks scored by students:

Marks	30 – 40	40 - 50	50 – 60	60 – 70	70 – 80	80 -90	90 – 100
No. of Students	13	18	23	15	12	10	9

Find:
(i) Mean **(5 marks)**
(ii) The standard deviation **(5 marks)**

b) 10 students in Physics and Chemistry test have the following set of marks:

Physics	10	18	22	32	33	38	47	55	60	75
Chemistry	12	18	28	26	37	32	40	40	66	53

(i) Determine the correlation coefficient (r) for this data: **(8 marks)**

$$r = \frac{SSxy}{\sqrt{SSx \bullet SSy}}$$

(ii) Comment on the value of r. **(2 marks)**