TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

DEGREE IN BACHELOR OF MEDICAL LABORATORY SCIENCE (BMLS)

AMA 4104: MATHEMATICS FOR SCIENCES

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2014

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

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) Simplify the following expressions:

(i) $\dfrac{\log 27}{\log 9}$ **(4 marks)**

(ii) $\dfrac{\frac{1}{2}x^{\frac{1}{2}}(1+x)^{-\frac{1}{2}} - \frac{1}{2}x^{-\frac{1}{2}}1 + x^{\frac{1}{2}}}{x}$ **(4 marks)**

b) (i) Evaluate $\dfrac{\log 25 - \log 125 + \frac{1}{2}\log 625}{3\log 5}$ **(4 marks)**

(ii) Find the difference between the sums of the first ten terms of the geometrical and arithmetical progressions which begins 6 + 12 + **(3 marks)**

c) Find the values of m and n in the polynomial $2x^3 + mx^2 + nx - 14$ such that x – 1 and x + 2 are its factors. **(5 marks)**

d) A triangle ABC has sides a = 9.0cm b = 7.5cm, and c = 6.5cm. Determine its three angles and its area. **(6 marks)**

e) Using the data below, compute:

(i) The upper quartile
(ii) Te lower quartile
(iii) The median **(6 marks)**

Variable	5	7	9	11	13	13	17	19
Frequency	1	2	7	9	11	8	5	4

Question Two

a) By completing the square, find the greatest value of $-7 + 12x - 3x^2$. **(4 marks)**

b) Three members in arithmetical progression are such that their sum is 15 and their product is 45. Find the three numbers:

c) If the roots of equation $x^2 - 5x - 7 = 0$ are α, β. Find the equations whose roots are:

(i) α^2, β^2 **(4 marks)**

(ii) $\alpha + 1.\ \beta + 1$ **(4 marks)**

d) Solve the given equation by completing the square $10 + 3x - 2x^2 = 0$ **(4 marks)**

Question Three

a) (i) Four members are to be selected from five members of party A and anther four members are to be selected from five members possible groupings are there? **(4 marks)**

(ii) In how many ways can 11 players be selected from 14 for a soccer team if no places have been filled? **(3 marks)**

b) In a geometrical progression, the sum of the second and third terms is 6, and the sum of the third and fourth terms is -12. Find:

(i) The first term **(3 marks)**
(ii) Common ratio **(3 marks)**

c) Draw the graph of $y = \sin x$ for $-270 \le x \le 270$ and use the graph to solve for x in sin x = -0.5 **(7 marks)**

Question Four

a) Expand $\frac{1}{(4-x)^2}$ in ascending powers of x as far as the term in x3, using the binomial theorem. **(7 marks)**

b) The following distribution relates to profits of 100 companies in '000' sh.

Profits	100 – 120	120 – 140	140 – 160	160 – 180	180 – 200	200 – 220	220 – 240
No. of Companies	17	53	199	194	327	208	2

Calculate to 2 decimal places:

(i) The mean profit **(5 marks)**

(ii) The modal profit **(5 marks)**

c) If $\sin\theta = 2/3$ and θ is obtuse, find without using calculators the value of $\cot\theta$. **(3 marks)**

Question Five

a) A husband and wife appear in an interview for two vacancies in the same post. The probability of the husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that:

(i) Both of them will be selected. **(2 marks)**

(ii) Only one of them will be selected **(4 marks)**

(iii) None of them will be selected. **(2 marks)**

b) Obtain the first FOUR terms of the expansion of $\left(1+\frac{1}{2}x\right)^{10}$ in ascending powers of x. Hence find the value of $(1.005)^{10}$, correct to four decimal places. **(6 marks)**

c) Solve the equation $7 = 4e^{-3x}$ to find x correct to 4 significant figures. **(6 marks)**