TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTHY SCIENCES
DEPARTMENT OF MATHEMATICS AND PHYSICS

UNIVERSITY EXAMINATION FOR THE DEGREE OF:
BTAP/BTRE/BSFQ/BTAC/BTMB/BMFT/BTIT/BSIT
YEAR ONE SEMESTER ONE
AMA 4104: MATHEMATICS FOR SCIENCE
SPECIAL/ SUPPLIMENTARY EXAMINATIONS
SERIES: September2018
TIME: 2 HOURS
DATE: September2018

INSTRUCTION TO CANDIDATES
You should have the following for this examination.
-Answer Booklet, examination pass and student ID.
This paper consists of FIVE questions.
Answer question ONE (COMPULSORY) and ANY other TWO questions.
The maximum marks for each question is shown.
Do not write on the question paper.
Mathematical tables and scientific calculators may be used.

Question One (30 marks)

a) Expand $\left(3\sqrt{2}-\sqrt{3}\right)\left(3\sqrt{2}+\sqrt{3}\right)$ (2 marks)

Hence rationalize $\dfrac{2\sqrt{2}}{\left(3\sqrt{2}+\sqrt{3}\right)}-\dfrac{2\sqrt{3}}{\left(3\sqrt{2}-\sqrt{3}\right)}$ (3 marks)

b) Solve the equation

$sin^2x - 3\cos x + 3 = 0$ (5 marks)

c) Show that $n!(n+2)=n!+(n+1)!$ (4 marks)

d) Prove the identity $\sin^2\theta \cot \theta \sec \theta = \sin \theta$. (2 marks)

e) Solve the cubic equation $x^3 -2x^2 - 5x + 6=0$ by using the factor theorem. (4 marks)

f) Given Sec x $=\dfrac{13}{12}$, find Sin x and Cot x (4 marks)

g) Suppose that a popular radio show received the following ratings over its season: 16, 15.2, 15.7, 15.5, 15.3, 15, 15.6, 14.8, 15.1, 14.6, 14.4, 15.3, 15.8, 14.7, 15.7, 14.2, 16.1, 14.9, 15.4, 14.9 Find the mean, median and range of the given data. (4 marks)

h) How many words can be formed from the word MISSISSIPPI? (2 marks)

Question Two (20 marks)

a) The second, fifth and eleventh terms of an arithmetic progression are in geometric progression. If the seventh term is 4, determine;

i. The first term and the common difference. (5 marks)

ii. What is the common ratio of the geometric progression? (3 marks)

b) If $p(x) = 3x^3 - 5x^2 + 3x - 10$ then show that $p(2) = 0$ and use the factor to factorize

p(x). (5 marks)

c) i. In how many ways can a group of 4 students be chosen from 8 eight students? (4 marks)

ii. If a particular student must be in the group, how many ways can the group be chosen? (3 marks)

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Question Three (20 marks)

a) Obtain the first three terms of the expansion $(1-3x)^7$ hence evaluate 0.97^7 to 4 significant figures. (6 marks)

b) Prove that $\sin 3A = 3\sin A - 4\sin^3 A$ (5 marks)

c) Solve for x
$$\log x^4 - \log x^3 = \log 5x - \log 2x$$
(4 marks)

d) Use quadratic formula to solve $2x^2 - 5x - 3 = 0$ (5 marks)

Question Four (20 marks)

a) Solve the inequality $|3x-1| < 4$ (4 marks)

b) Solve the equation

$2^{x+1} + 2^{x+2} + 2^x = 56$ (5 marks)

c) Prove the following combination equation $\quad ^nC_r + {}^nC_{r+1} = {}^{n+1}C_{r+1}$ (6 marks)

d) Solve using completing square method $3x^2 + 6x = 9$ (5 marks)

Question Five (20 marks)

a) Draw a cumulative frequency graph for the following data:

eight (cm)	150-154	155-159	160-164	165-169	170-174
Frequency	4	22	56	32	5

(6 marks)

b) Using the graph above, estimate
   i)   the median (2 marks)
   ii)   the interquartile range (4 marks)

c) A ferry which holds ten people carries a group of thirteen men and seven women across a river. Find the number of ways in which the group may be taken across if all the women go on the first trip. (4 marks)

d) A committee of six is to be formed from nine women and three men. In how many ways can the members be chosen so as to include at least one man. (4 marks)