TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MARINE ENGINEERING

EMR 2106: ENGINEERING MATHEMATICS I

SPECIAL/ SUPPLIMENTARY EXAMINATIONS

SERIES:SEPTEMBER 2018

TIME: 2HOURS

DATE: Pick DateSep2018

Instructions to Candidates
You should have the following for this examination
-Answer Booklet, examination pass and student ID, Scientific calculator, a ruler
This paper consists of **FIVE** questions. Attemptquestion ONE (Compulsory) and any other TWO questions.
Do not write on the question paper.

Question 1

a) An alloy is made of metals A and B in the ration 2.5:1 by mass.

Determine how much of metal A has to be added to 6kg of B to make the alloy. (2 Marks)

b) The output power of an engine is 450kw .If the efficiency of the engine is 75%.

Determine the power input. (2 Marks)

c) Solve for x in the equation :

i) $\frac{81^x.27^x}{9^x} = 729$ (4 Marks)

ii) $1 + \log_5 x = \log_5 12$ (6 Marks)

d) The parents of St John Secondary School decided to buy a school bus which is costing Kshs 3600,000. Each parent was to contribute the same amount of money. Before they contributed, 60 parents transferred their children to other schools and therefore did not contribute.

As a result, the remaining parents each contributed Kshs 2000 more:

i) Determine the original number of parents.

ii) How much each parent contributed at the end. (7 Marks)

e) Insert four terms between 5 and 22.5 to form an arithmetic progression. (5 Marks)

f) If Kshs 10000 is invested in a money market paying 12% compound interest per annum .How long will it take for the amount to surpass Kshs 20,000 to the nearest year. (4 Marks)

Question 2

a) An auditorium has 20 seats on the first row, 24 seats on the second row, and 28 seats on the third row and so on. The auditorium has 30 rows of seats. How many seats are in the theatre (4 Marks)

b) The eighth term of an arithmetic progression is twice the third term and the sum of the first eight terms is 39.

i) Determine the first three terms of the progression

ii) Show that the sum of the first n-terms $= \frac{3}{8} n(n + 5)$ (7 Marks)

c) For a GP Series , the sum of the first and the third term is 4. The sum of the second and the fourth term is 96.

Determine

i) The first term

ii) The sixth term   (5Marks)

d) If Kshs 1200 is invested at a compound interest of 7.5% per annum. Determine how long it takes for the amount to double .Give your answer to the nearest year. (4 Marks)

Question 3

a) Determine the standard deviation from the mean of the set of numbers.

(5, 6, 8, 4, 10, 3)

b) The frequency distribution for the value of resistance in ohms of 48 resistors is as shown below.

20.5 - 20.9	3
21.5 - 21.9	11
22.5 - 22.9	9
21.0 - 21.4	10
22.0 – 22.4	13
23.0 – 23.4	2

Determine

i) The Mean

ii) The Standard deviation   (10 Marks)

c) The number of television sets repaired in a workshop by a technician in six, one – month periods is as shown.

Month	January	February	March	April	May	June
Number of TVs repaired	11	6	15	9	13	8

present this data on a pictogram   (3 Marks)

d) The number of issues of tools or materials from a store in a factory is observed for seven , one – hour periods in a day, and the results of the survey are as follows:

Period	1	2	3	4	5	6	7
Number of issue	34	17	9	5	27	13	6

Present this data on a vertical bar chart   (3 Marks)

Question 4

a) Convert the following numbers to binary

    i) $(27)_{10}$ (3 Marks)

    ii) $(426)_8$ (4 Marks)

b) Convert the following to decimal numbers

    i) $(625)_8$

    ii) $(10010111)_2$

    iii) $(427)_{16}$ (9 Marks)

c) Convert to hexa – decimal

    i) $(5172)_{10}$

    ii) $(441)_8$ (4 Marks)

Question 5

a) Solve for x in the following equation

    i) $21 = 33\left(1 - e^{-x/2}\right)$ (5 Marks)

    ii) $9^{x+1} + 3^{2x-1} = 28$ (5 Marks)

b) Evaluate $\log_9 21$ (4 Marks)

c) The temperature θ_2 degree Celsius of a winding which is being heated electrically , at time t seconds, is given by

$$\theta_2 = \theta_1 \left(1 - e^{-t/T}\right)$$

Where θ_1 the temperature is at time t-0 seconds and T seconds is a constant.

Determine the time t seconds for θ_2 to be half the value of θ_1 given T= 73 seconds. (6 Marks)