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TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

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UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MARINE ENGINEERING

EMR 2106: ENGINEERING MATHEMATICS I

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2HOURS

DATE: Pick Date Dec 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Q.1 a) Obtain 7/15 of (15 x 5/7) + (¾ ÷ 15/16) (4 marks)

b) Copper, Zinc and another metal is used to form an alloy whose total mass is 96Kg.

If Copper and Zinc form three quarters of the alloy, determine the mass of Zinc and copper in the alloy if their ratio is 5:1. (3 marks)

c) Solve for x in the equation.

(i) $1 + 2 \text{Log}_3 x = \text{Log}(28x - 9$

(ii) $\frac{3^o}{9^{x^2}} = 3^{x-1}$ (10 marks)

d) Determine the smallest number of terms of the G.P. (6 marks)
8 + 24 + 72 + ….. that will give a sum greater than 6,000,000. (4 marks)

e) In an arithmetic progression, the sum of the first five terms is 30, the third term is equal to the sum of the first two terms.

Determine the first five terms. (3 marks)

f) Write the following numbers in binary

$(246)_8$ (6 marks)

Q.2 a) Convert the following numbers to binary numbers

(i) $(21)_{10}$

(ii) $(543)_8$ (6 marks)

b) Convert the following to decimal number

(i) $(541)_8$
(ii) $(10101101)_2$
(iii) $(a539)_{16}$ (9 marks)

c) Convert to hexa-decimal
(i) $(5071)_{10}$

(ii) $(541)_8$ (5 marks)

Q.3 a) The amount of money earned weekly by 40 people working as part-time in a factory, correct to the nearest 10 shs. Is as given;

80	90	70	110	90	160	110	80
140	30	90	50	100	110	60	100
80	90	110	80	100	90	120	70
130	170	80	120	100	110	40	110
50	100	110	90	100	70	110	80

Form a frequency distribution with 6 classes for these data. (4 marks)

b) The frequency distribution given below refers to the heights in centimeters of 100 people.

Class	**Frequency**
150 – 156	5
157 – 163	18
164 – 170	20
171 – 177	27
178 – 184	22
185 – 191	8

(i) Determine the mean height.
(ii) Determine the standard deviation. (9 marks)

c) The frequency distribution given below refers to the over-time worked by a group of craftsmen during each of 48 working weeks in a year. (7 marks)

Class	**Frequency**
25 – 29	5
30 – 34	4
35 – 39	7
40 – 44	11
45 – 49	12
50 – 54	8
55 – 59	1

Draw an ogive for this data and hence determine the quartile values.

Q.4 a) The twenty first term of an AP is 37 and the sum of the first twenty terms is 320.

Determine the sum of the first ten terms. (5 marks)

b) The third term of a G.P is 2 and the fifth is 18.

Find the two possible values of the common ratio. (5 marks)

c) The sum to infinity of a GP with a positive common ratio is 9 and the sum of the first two terms is five.

Determine the first four terms of the progression. (5 marks)

d) Determine the number of terms of the AP.

2 + 3¼ + 4½ + … required to make a total of 204. (5 marks)

Q.5 a) Solve for x in the equation.

(i) $9^x + 3^{2x-2} = 30$

(ii) $2^{x-3} = 3^{x-3.3691}$ (10 marks)

b) Solve for x in the following equations

(i) $\log_{16} 4 - \log_4 (x + 953) = -\frac{9}{2}$

(ii) $Log_x^3 + \frac{5}{2} Log_3 x = 2$ (10 marks)