

TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Engineering and Technology
DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING
DIPLOMA IN TECHNOLOGY IN MARINE ENGINEERING (DMAE 1)

EMR 2103
MARINE ELECTRICAL I

END OF SEMESTER EXAMINATIONS
SERIES: DECEMBER , 2016
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- 1. You should have the following for this examination:**
 - **Answer Booklet**
 - **A Non-programmable Scientific Calculator**
- 2. This paper consists of FIVE Questions**
- 3. Answer ANY THREE Questions**
- 4. All questions carry equal marks.**
- 5. This paper consists of THREE printed pages.**

Question ONE

a) State:

- i. The different accident types depending upon the severity, durability and degree of the injury:
- ii. What is residual current device(RCD) and how does it work
- iii. Holger Nielsen method

(10 marks)

b) Consider a load that consumes 1kW of power at a power factor of 0.8 lagging and operates at 115 V (r m s). The load is connected to a voltage source by a wire with a resistance of 0.1Ω .

- What is the power supplied by the source?

(6 marks)

c) Compare series and parallel circuits.

(4 marks)

Question TWO

a) Differentiate between magnetic field strength and magnetic flux density
Differentiate between permeability and relative permeability

(6 marks)

b) State and explain applications of any five different fire extinguisher types

(10 marks)

c) State:

Ohm's law for magnetic circuit.

What is meant by electromagnetic torque in motors?

(4 marks)

Question THREE

a)

- i. What is Quality (Q) factor
- ii. What are the three main regimes which can be considered when referring to the damping and Q factor in electric circuits

(8 marks)

b) Describe the main fire types:

(10 marks)

c) Calculate the resistance of each of these specimens, given their resistance at the reference temperature ($R_r @ T_r$), and their present temperatures (T):

- Specimen 1: Copper ; $R_r = 200 \Omega @ T_r = 20^\circ\text{C}$; $T = 45^\circ\text{C}$; $R_T =$

(2 marks)

Question FOUR

a) Derive the Wheatstone bridge equation:

(8marks)

b) A length of copper wire ($\alpha = 0.004041$ at 20°C) has a resistance of 5 ohms at 20 degrees Celsius. Calculate its resistance if the temperature were to increase to 50 degrees Celsius.

(4 marks)

c) Consider a steel with the mean length of 20 m, the cross section of 2 m^2 . What is the Magnetic reluctance

(6 marks)

d) Based on properties and area of applications, state the main electrical material types

(2 marks)

Question FIVE

(a) State the four most common battery charging methods

(8 marks)

(b) Describe any two different definitions of **power in AC** circuits using equations where applicable

(4 marks)

(c) Describe the main power factor improvement methods

(8 marks)