JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

UNIVERSITY EXAMINATIONS FOR THE DIPLOMA IN MARINE ENGINEERING (TVET)

1ST YEAR 2ND SEMESTER 2023/2024 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TDM 2125

COURSE TITLE: ELECTRICAL PRINCIPLES

EXAM VENUE: **STREAM: Dip Marine Eng**

DATE: ../04/2024 **EXAM SESSION:**

DURATION: 2 HOURS

Instructions

1. **Answer question 1 (Compulsory) and ANY other three questions**
2. **Candidates are advised not to write on question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE (40 MARKS)

a) Define the term "current" and explain how it is measured. (4 Marks)

b) State two safety precautions that should be taken when working with electrical circuits. (2 Marks)

c) State Ohm's Law (2 Marks)

d) State 3 instruments and the respective electrical parameters they measure (6 Marks)

e) Define Kirchoff's Current Law (2 Marks)

f) State three major classification electrical machines (3 Marks)

g) Differentiate between motors and generators (4 Marks)

h) Define the term earthing (2 Marks)

i) State three types of earthing (3 Marks)

j) State three types of electrical faults (3 Marks)

k) Define the term electrodynamics (2 Marks)

l) Differentiate between electric field and electric potential (4 marks)

m) State three applications of electromagnetic waves (3 Marks)

QUESTION TWO (20 MARKS)

a) For the circuit shown in figure 1 below, calculate:

i. The value of resistor Rx such that the total power dissipated in the circuit is 2.5 kW (2 Marks)

ii. The current flowing in each of the four resistors. (4 Marks)

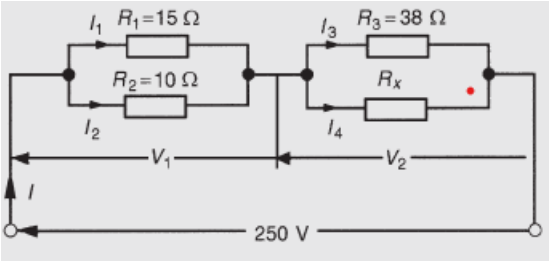

Figure 1

b) Explain the component parts of a photovoltaic system using a well labelled block diagram. (8 Marks)

c) Describe three ways of improving a power factor (6 Marks)

QUESTION THREE (20 MARKS)

a) Describe two types of passive networks using an example in each case (6 Marks)

b) Describe two Two-Port Network Parameters used in analysing transmission lines (4 Marks)

c) Explain the principle of operation of motors using a suitable diagram (8 Marks)

d) Describe the function of transformers (2 Marks)

QUESTION FOUR (20 MARKS)

a) Explain two importance of earthing (4 Marks)

b) Describe three safety precautions to consider when working with earthing systems (6 Marks)

c) Describe three components of an electrical system protection (6 Marks)

d) Explain two essential qualities of a good protective system (4 Marks)

QUESTION FIVE (20 MARKS)

(a) Describe two sources of magnetic fields (4 Marks)

(b) A plane wave with an electric field E = 10 V/m and a magnetic field B = 2 x 10^{-5}T propagates through free space.

i. Calculate the magnitude of the Poynting vector (S).

ii. Determine the power carried by the wave per unit area (intensity). (6 Marks)

(c) Describe two applications of electrodynamics. (4 Marks)

(d) A point charge of +2 nC is placed at the origin, and a point charge of -5 nC is placed 10 cm away. Calculate the magnitude of the electric field at a point 5 cm to the right of the +2 nC charge. (6 Marks)