



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

EED 311: MACHINES AND UTILIZATION

DATE: 19/10/2020

TIME: 2.00-4.00 PM

INSTRUCTIONS

Answer Question One and any Other Two Questions

QUESTION ONE (30 MARKS)

- a) Explain the following terms, with reference to drives:
 - i. Group drives
 - ii. Individual drives (4 marks)
- b) State:
 - i. The factors to consider for selection of electric drives
 - ii. Three advantages and disadvantages of electric group drives (10 marks)
- c) A field coil has a heat dissipating surface of 0.15m^2 , and a length of 1 m. It dissipates 150W, with emissivity of 34W/m^2 . Calculate final temperature rise and time constant if the area is 5000mm^2 , specific heat is 390J/kg , space factor 0.56 with a weight of 8900kg/m^2 (6 marks)
- d) Enumerate the major requirements of ideal traction system (6 marks)
- e) Explain the major types of electric traction system (4 marks)

QUESTION TWO (20 MARKS)

- a) Explain the terms:
 - i. Continuous rating
 - ii. Continuous maximum rating
 - iii. Intermittent rating (6 marks)

- b) State three assumptions made when deriving the heating – time equations. (3 marks)
- c) Explain the following enclosures and transmission drive.
 - i. Screen protected
 - ii. Direct drive (4 marks)
- d) i Define a traction system
 - ii highlight the advantages and disadvantages of electric traction system (7 marks)

QUESTION THREE (20 MARKS)

- a) i) List the basic conditions of a good braking system
 - ii) Explain the following braking systems, regenerative and plugging (8 marks)
- b) With the aid of the diagram explain the operation of the following special machines
 - i. stepper motor
 - ii. hysteresis motor
 - iii. linear motor (12 marks)

QUESTION FOUR (20 MARKS)

- a) Define the following terms with respect to refrigeration and air conditioning
 - i. Refrigerant
 - ii. Refrigeration capacity (4 marks)
- b) With the aid of a diagram ,explain the operation of the vapour compression refrigeration system. (16 marks)

QUESTION FIVE (20 MARKS)

- a) Define the terms heating:
 - i. Heating time constant
 - ii. Cooling time constant (4 marks)
- b) State the assumptions made during derivation of the heating time expression (3 marks)
- c) with the aid of a sketch diagram draw the temperature rise and cooling curve (4 marks)
- d) The temperature rise of a motor is 25°C after one hr and 37.5°C after 2hrs .calculate its final steady temperature rise and heating time costant.If its temperature falls to 40°C in 1.5hrs calculate the cooling time constant .the ambient temperature is 30°C (9 marks)