



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

MACHINES AND UTILIZATION

DATE: 18/01/2021

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:
- group drives
 - individual drives (4 marks)
- b) State:
- The factors to consider for selection of electric drives
 - Three advantages and disadvantages of electric group drives (10 marks)
- c) A field coil has a heat dissipating surface of 0.12m^2 , and a length of 1 m. It dissipates 200W, with emissivity of 44w/m^2 . Calculate final temperature rise and time constant if the area is 6000mm^2 , specific heat is 440J/kg , space factor 0.6 with a weight of 9900kg/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:
- Continuous rating
 - Continuous maximum rating
 - Intermittent rating (6 marks)

- b) State three assumptions made in 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)
- 3 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. Reluctance
 - iii. linear motor (12 marks)
- 4 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)
- 5 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 constant.If its temperature falls to 60°C in 1.5hrs calculate the cooling time constant .the ambient temperature is 40°C (9 marks)