MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

MACHINES AND UTILIZATION

DATE: 17/8/2021 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS:

Answer Question One And Any Other Two Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Explain the following terms, with reference to drives:

i) group drives

ii) Multi-drive (4 marks)

b) State:

i) The Five 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 $0.18m^2$,and a length of 5 m.It dissipates 500w ,with emissivity of $45w/m^2$.Calculate final temperature rise and time constant if the area is $8000mm^2$,specific heat is 540j/kg.space factor 0.8 with a weight of $7700kg/m^2$ (6 marks)

d) Enumerate the Four 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 in deriving the heating – time for motors 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) Reluctance

iii) linear motor (12 marks)

QUESTION FOUR (20 MARKS)

a) Define the following terms with respect to refrigeration and air conditioning

i) Refrigerant

ii) Refrigiration capacity (4 marks)

b) With the aid of a diagram ,explain the operation of the wter compression refrigeration system (16 marks)

QUESTION FIVE (20 MARKS)

a) Define the following terms with reference to heating in motors:

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 $50^{O}C$ after 2 hr and $70\ ^{O}C$ after 4hrs .calculate its final steady temperature rise and heating time costant.If its temperature falls to $40\ ^{O}C$ in 3hrs calculate the cooling time constant .the ambient temperature is $35\ ^{O}C$ (9 marks)