MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ENGINEERING TECHNOLOGY

UNIVERSITY ORDINARY EXAMINATION

2021/2022 ACADEMIC YEAR

THIRD YEAR **FIRST** SEMESTER EXAMINATION FOR, DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

EEE 069: MACHINES UTILIZATION I

DURATION:2 HOURS

DATE:

TIME:

Instructions to candidates:

1. Answer question One and Any Other Two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

1. a) State two methods for starting synchronous motor. (2 marks)

b) Explain the construction of the following parts of induction motor.

i) Fans

ii) Slip-ring

iii) Bearings (6 marks)

c) Explain any two:

i) Causes of Hunting in synchronous motor

ii) Effects of Hunting in synchronous motor

iii) Reduction of Hunting in synchronous motor (6 marks)

d) With an aid of circuit diagram. Describe direct on line (D.O.L) forward – reversed control diagram. (6 marks)

e) A 4 pole, $50H_z$, 7.46 kw motor has at rated voltage and frequency, a starting torque of 160 percent and maximum torque of 200 per cent of full load torque. Determine;

i) full-load speed

ii) Speed at maximum torque

(6 marks)

f) State any four advantages of individual drive. (4 marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

2. a) State any four advantages of using squirrel cage motor compared with slip ring induction motor. (4 marks)

b) A three phase induction motor has four poles and is connected to 50 Hz supply. Slip is 2%. Calculate actual speed. (3 marks)

c) Explain any three types of abnormal condition in induction motor. (6 marks)

d) A 440 V, 3 phase, 50 H_3, 4-pole star – connected induction motor has a full load speed of 1425 rpm. The motor has an impedance of (0.4 +j4) ohms and rotor / stator turn ratio of 0.8. Calculate;

i. full-load torque
ii. rotor current and copper loss
iii. power output if windage and friction losses amount to 500 W
iv. maximum torque (7marks)

QUESTION THREE (20 MARKS)

3. a) State any two application of synchronous motor. (2 marks)

b) Define the term hunting as it's used in synchronous motor. (2 marks)

c) Explain the locus of armature current versus field current for different loads on a synchronous motor. (8 marks)

d) A 6600V, 3 phase, star connected synchronous motor draws a full-load current of 80 A at 0.8 p.f leading. The armature resistance is 2.2Ω and synchronous reactance 22Ω per phase. If the stray losses of the machine are 3200W, determine;

i) the emf induced
ii) the output power
iii) the efficiency (8marks)

QUESTION FOUR (20 MARKS)

4. a) State any four advantages of electric drives. (4 marks)

b) Explain any Two Factors that influences the choice of electric drive. (4 marks)

c) With an aid of well labelled block diagram, show the functional of the sequence in electric drive system. (6 marks)

d) Explain the following terms

i. continuous duty
ii. short time duty
iii. intermittent duty

(6 marks)