



MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

UNIVERSITY ORDINARY EXAMINATION

2018/2019 ACADEMIC YEAR

**THIRD YEAR SECOND SEMESTER EXAMINATION FOR, DIPLOMA
ELECTRICAL AND ELECTRONICS ENGINEERING**

SEE 1307 - ELECTRICAL MACHINES UTILIZATION II

DURATION: 2 HOURS

DATE: 14/12/2018

TIME: 2 – 4 P.M.

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)

a. Explain the following laws as applied in D.C machines;

i. Lenz's law

ii. Maxwell's law

(4 Marks)

b. Given the following parameters for a rotating machine, derive the armature torque equation in DC series motor.

R = Average radius of armature in –m

L = effective length of each conductor

Z = total number of armature conductor

A = number of parallel paths

I = current in each conductor

B = average flux density

\emptyset = flux per pole

P = number of poles

(5 Marks)

c. State any FOUR desirable characteristics of a good refrigerant

(4 Marks)

d. Explain any TWO control elements in air-conditioning units

(4 Marks)

e. Describe one method of detecting leaks in the following refrigerant:

i. Ammonia

ii. Freon

(4 Marks)

f. In a 100v compound generator, the resistance of the armature, shunt and series windings is 0.06Ω 25Ω and 0.04Ω respectively. A load consists of 200 lamps each rated at 55w, 110v.

calculate the emf generated and armature current when the machine is connected

i. Long shunt

(3 Marks)

ii. Short shunt

(3 Marks)

iii. If a diverter of 0.1Ω is connected to series resistance in parallel at long shunt connection.

Calculate change in current in series resistance

(3 Marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

- a. Define the following terms;
 - i. Refrigeration
 - ii. Air conditioning (4 Marks)
- b. Explain any THREE routine maintenance requirement for kitchen refrigerators (6 Marks)
- c. Describe construction and operation of room air conditioner (10 Marks)

QUESTION THREE (20 MARKS)

- a. State any THREE applications of compound generator (3 Marks)
- b. A shunt generator supplies 96A at a terminal voltage for 200 volts the armature and shunt field resistance are 0.1Ω and 50Ω respectively. The iron and friction losses is 2500 W. Calculate:
 - i. Emp generated (3 Marks)
 - ii. Copper losses (2 Marks)
 - iii. Commercial efficiency (2 Marks)
- c. With graphs, explain characteristics of the following DC meter connection
 - i. Speed-torque characteristics
 - ii. Speed-armature current characteristics (10 Marks)

QUESTION FOUR (20 MARKS)

- a. State any FOUR advantages of Switched Reluctance Motor (SRM) (4 Marks)
- b. A stepper motor has a step angle of 10° and is required to rotate at 200 r.p.m. Calculate the pulse rate in steps per second for this motor (3 Marks)
- c. Outline any FIVE differences between variable reluctance stepper motor and switched reluctance motor (5 Marks)
- d. With the diagram, explain the operation of Brushless Motor (8 Marks)