

TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Engineering and Technology
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING
DIPLOMA IN ELECTRICAL POWER ENGINEERING (DEPE4)

EEP 2204
ELECTRICAL MACHINES I

END OF SEMESTER EXAMINATIONS

SERIES: APRIL, 2016

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- 1. You should have the following for this examination:**
 - **Answer Booklet**
 - **A Non-programmable Scientific Calculator**
- 2. This paper consists of FIVE Questions**
- 3. Answer ANY THREE Questions**
- 4. All questions carry equal marks.**
- 5. This paper consists of THREE printed pages.**

Question ONE

a) State:

- i. Fleming's right hand rule.
- ii. Fleming's Left hand rule.
- iii. What are the losses called as core loss?

(6 marks)

b) Draw torque speed characteristics of a three phase induction motor.

(4 marks)

c)

- i. With the aid of a diagram explain three methods of starting single phase induction motors

(9 marks)

- ii. Define the term commutation in dc machines.

(1 mark)

Question TWO

a) Using appropriate diagrams describe the different methods of electrical braking of dc motors.

- (i) Dynamic or Plugging braking
- (ii) Regenerating braking
- (iii) Rheostatic braking

(12 marks)

b) Explain the operation of the shaded pole motor

(4 marks)

- c) A 220V d.c machine has an armature resistance of 0.6Ω . If the armature current is 30A. Find the induced e.m.f when the machine acts as
- i. Generator
 - ii. Motor
- (4 marks)**

Question THREE

- a) State:
- i. Faradays laws of electromagnetic induction.
 - ii. Factors on which the speed of a dc motor depends
- (5 marks)**
- b) A short shunt compound generator delivers a load current of 30A at 220V and has armature series-field resistances of 0.06Ω , 0.20Ω and 300Ω respectively. Draw the circuit diagram of the stated circuit and calculate the induced e.m.f and the armature current. Allow 1.0V per brush for contact drop.
- (6 marks)**
- c)
- i. Describe the three main D.C generator characteristics
 - ii. State the methods of generator excitations
- (9 marks)**

Question FOUR

- a) Describe the four distinct categories of repulsion type motors
- (8 marks)**
- b) Describe the basic construction of a repulsion motor
- (4 marks)**

- c) A long shunt compound generator delivers a load current of 50A at 500V and has armature, series field and shunt field resistance of 0.05Ω , 0.03Ω and 250Ω respectively. Calculate the generated voltage and the armature current. Allow 1V per brush for contact drop

(4 marks)

- d) State the main classification types of single phase motors based on their methods of starting and construction

(4 marks)

Question FIVE

- a) Using suitable diagrams state and explain the speed control mechanisms used in universal motors

(9 marks)

- b) State the main motor characteristics

(3 marks)

- c) A D.C motor takes an armature current of 170A at 480V. The armature circuit resistance is 0.5Ω . The machine has 8 poles and the armature is lap connected with 960 conductors. The flux per pole is 0.06wb. Calculate:

- i. The speed
- ii. The gross torque developed by the armature

(8 marks)