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 breaking 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)