TECHNICAL UNIVERISTY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

DIPLOMA IN ELECTRICAL POWER ENGINEERING (DEPE 4)

EEP 2204: ELECTRICAL MACHINES I

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2014
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consists of **FIVE** questions. Answer any **THREE** questions
Maximum marks for each part of a question are as shown

This paper consists of **TWO** printed pages

Question One (Compulsory)

a) (i) With the aid of a diagram and waveforms show that a three phase winding connected to a three phase supply produces a rotating magnetic field.

(ii) State TWO characteristics of this field **(10 marks)**

b) Explain how torque is produced in an induction motor **(6 marks)**

c) (i) Explain why an induction motor takes a high starting current.
(ii) Explain why an induction motor cannot run at synchronous speed. **(4 marks)**

Question Two

a) Explain why a single phase induction motor is not self starting. **(3 marks)**

b) With the aid of diagram explain THREE methods of starting single phase induction motors. **(12 marks)**

c) Explain the operation of the shaded pole motor **(5 marks)**

Question Three

a) Describe FOUR principal losses in DC machines. **(8 marks)**

b) Explain how speed control is achieved in DC motors. **(4 marks)**

c) A six pole lap wound motor is connected to a 250V d.c. supply. The resistance of 1Ω. A current of 40A flows through the armature and the flux per pole is 20mwb. Determine:
(i) The speed
(ii) Torque developed **(8 marks)**

Question Four

a) Explain armature reaction in DC machines. **(6 marks)**

b) State:
(i) The effects of armature reaction
(ii) Methods of minimizing armature reaction **(8 marks)**

c) (i) Define commutation
(ii) State the methods of improving commutation **(6 marks)**

Question Five

a) Define the term slip in induction machines. **(2 marks)**

b) Draw the Torque speed characteristics of a three phase induction motor and explain the curve. **(6 marks)**

c) Draw the circuit diagram of the direct on line method of starting three phase induction motors and state why it is unsuitable for large machines. **(7 marks)**

d) A 415 three phase 50Hz 4 pole star connected induction motor operates at 1425 rev/min on full load. Determine:

(i) Synchronous speed
(ii) Slip **(5 marks)**