



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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## University Examinations 2013/2014

SECOND YEAR, SECOND SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL  
ENGINEERING

### EEE 0232: ELECTRICAL MACHINES II

DATE: APRIL 2014

TIME: 1 ½ HOURS

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**INSTRUCTIONS:** Answer question *one* and any other *two* questions

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#### QUESTION ONE – (30 MARKS)

- (a) Explain the construction of a wound motor, with aid of appropriate diagrams. (6 Marks)
- (b) Express in a sketch the torque slip and speed characteristics of an induction machines. (4 Marks)
- (c) Explain the following methods of 3 phase induction motor starting using appropriate diagrams
  - (i) Auto transformer (4 Marks)
  - (ii) Star delta (4 Marks)
- (d) A 6 pole 3 $\phi$  induction motor runs at 670rev/min calculate
  - (i) Synchronous speed
  - (ii) Rotus slip
  - (iii) Frequency of rotor current (6 Marks)
- (e) Show that maximum torque for an induction motor is given when  $x = R$ . (6 Marks)

### QUESTION TWO – (15 MARKS)

A 400V, 50HZ 3 $\phi$  2 pole star connected induction motor runs at 48.5 rev/s on full load. The motor resistance and reactance per phase are 0.4 $\Omega$  and 4.0 $\Omega$  respectively, if the rotor-stator turns ratio is 0.8:1, calculate

- (a) Synchronous speed (3 Marks)
- (b) Max.torque (3 Marks)
- (c) Speed at which max torque occurs (3 Marks)
- (d) Power output if mechanized losses at 500W (3 Marks)
- (e) The starting torque (3 Marks)

### QUESTION THREE – (15 MARKS)

- (a) Explain the principle of operation of a 3 phase induction motor under;
  - (i) Production of rotating magnetic flux. (6 Marks)
  - (ii) Production of torque (6 Marks)
- (b) Find the synchronous speed for a 4 pole 3 $\phi$  50HZ induction motor whose slip is 4%. (3 Marks)

### QUESTION FOUR – (15 MARKS)

- (a) Draw a well labelled approximate equivalent circuit for an induction motor. (6 Marks)
- (b) Give three reasons why induction machines are the most extensively used machines for various, kinds of electrical drives. (6 Marks)
- (c) State disadvantages of induction motors. (3 Marks)

### QUESTION FIVE – (15 MARK)

Explain the following methods of:

- (a) Starting an induction motor
  - (i) Star delta (4 Marks)
  - (ii) Auto transformer (4 Marks)
- (b) Stopping an induction machine
  - (i) Plogging (3 Marks)
  - (ii) D.C current injection (4 Marks)