



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION DIPLOMA IN ELECTRICAL
ENGINEERING

EED 214: ELECTRICAL MACHINES 11

DATE: 15/12/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS:

Answer Question One and Any Other Two Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) State any **four** advantage of squirrel cage induction motor (4 marks)
- b) Explain the operation of a three phase induction motor (6 marks)
- c) List any **four** characteristics of synchronous motor (4 marks)
- d) Explain any **three** effects of changing field excitation of any synchronous motor (3 marks)
- e) Explain the operation of linear motor (7 marks)
- f) A 6 pole ,3 phase induction motor operation from 50 Hz supply .Calculate
 - i) Synchronous speed
 - ii) Rotor speed at a slip of 5 %
 - iii) frequency of rotor current at stand still (6 marks)

QUESTION TWO (20 MARKS)

- a) List the condition maximum torque at
- i) stand still
 - ii) running condition of a three phase induction motor (6 marks)
- b) A 415V .three phase ,50 Hz , 4 pole star connected induction motor runs at 24 rev/s on full .The motor resistance and reactance per phase is $0.4\ \Omega$ and 4.5Ω respectively effective motor stator turns ratio is 0.9 : Calculate
- i) Synchronous speed
 - ii) Slip
 - iii) Full speed torque
 - iv) Starting torque
 - v) Maximum torque (14 marks)

QUESTION THREE (20 MARKS)

- a) State any **four** conditions to be observed before synchronous a machine to supply 4mks
- b) 11000V, three phase synchronous motor is 50A .The reactance and resistance per phase are 40Ω and 1Ω respectively
- Calculate
- i) power supplied at 0.8 p.f lagging
 - ii) Induced E.M.F for p.f 0.8 lagging
 - iii) induced E.M.F for a p.f 0.6 lagging (16 marks)

QUESTION FOUR (20 MARKS)

- a) Define the following terms bas applied to induction motors
- i) cogging
 - ii) crawling (4 marks)
- b) State any **four** reasons why the motor conductors of squirrel cage motor are skewed (4 marks)
- c) With the aid a diagram explain the star –delta method of starting induction motor 12mks

QUESTION FIVE (20 MARKS)

- a) List any **three** characteristics of linear motor (6 marks)
- b) With the aids of a diagram explain the operation of a A.C series motor (14 marks)