



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION DIPLOMA IN ELECTRICAL ENGINEERING

EED 204: ELECTRICAL MACHINES 1

DATE: 18/12/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS:

ANSWER QUESTION ONE AND ANY OTHER TWO

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Explain the following parts of a D.C machine
- i) Yoke
 - ii) Commutator
 - iii) Pole shoes (6 marks)
- b) Classify D.C motors in terms of the winding connections (4 marks)
- c) Explain the need of power factor improvement to
- i) Consumer
 - ii) Supply authorities (6 marks)
- d) With the aid of a labeled diagram explain operation of capacitor start capacitor run motor (6 marks)
- e) A 20 kw ,200v d.c shunt generator has an armature and field resistance of 0.1 and 100 respectively .calculate the total armature power developed when running
- i) As a generator
 - ii) As a motor (8 marks)

QUESTION TWO (20 MARKS)

- a) List the **three** factor which determine the amount of E.M.F generated by a given generator (3 marks)
- b) Outline any **three** application of
- i) D.C shunt motor
 - ii) D.C series motor (6 marks)
- f) Explain any **three** methods of speed control of D.C motor (6 marks)
- g) D) A 500V shunt motor runs at its normal rated speed of 250 rpm .When the armature current is 200 A .The resistance of the armature is 0.125Ω .calculate the speed when a resistance is inserted in the field reducing shunt field to 80 % of its normal value and armature current 100 A. (5 marks)

QUESTION THREE (20 MARKS)

- a) List any **four** advantage of using static capacitor in power factor improvement. (4 marks)
- b) Explain the synchronous modifier method of improving power factor (6 marks)
- c) A single phase motor connected to a 240 V, 50 Hz supply takes 10 A at a power factor 0.8 lagging. A capacitor is shunted across the motor to raise power factor to 0.9. Calculate of the capacitor used (10 marks)

QUESTION FOUR (20 MARKS)

- a) Explain reasons why single phase motor resist self-starting (4 marks)
- b) List any **four** characteristics of split phase single phase motor (6 marks)
- c) With the aid of a diagram explain the operation of a single phase universal motor. (10 marks)

QUESTION FIVE (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 and 4.5 respectively effective motor stator turns ratio is 0.9 : Calculate
- i) Synchronous speed
 - ii) Slip
 - iii) Full speed torque
 - iv) Starting torque

(14 marks)