



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)

University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND
ELECTRONICS ENGINEERING

SUPPLEMENTARY EXAMINATION

EED204: MACHINES I

DATE: 3/8/2016

TIME: 11.00-1.00 PM

INSTRUCTIONS TO CANDIDATES

Attempt any three questions.

1. a) With the aid of a diagram describe the single phase shaded – pole motor (7 marks)
- b) Explain why a single – phase induction motor is not self –starting (3 marks)
- c) Explain the method of minimizing armature reaction in a d.c machine by using compensating windings (3 marks)
- d) Describe with a diagram the construction and operation of the commutator of a d.c generator (7 marks)
2. a) Show that the torque on a conductor rotating in ad.c motor magnetic field is given by the expression

$$T = \frac{p\phi I}{\pi} \quad \text{Nm per conductor}$$

where I= armature current per conductor in amperes

p = pole – pairs

ϕ =magnetic flux per poleinwebers (4 marks)

- b) With the aid of load characteristics curve describe a series type d.c motor (6 marks)
- c) Explain with a aid of a diagram the method of speed control of d.c shunt motor by armature voltage variations (6 marks)
- d) Explain the following with regard to d.c machines
- i) Iron losses
 - ii) Copper losses (4 marks)
3. a) Describe with a diagram the construction of a d.c machine (8 marks)
- b) i) Derive from first principles the expression for the speed equation of a d.c motor . (3 marks)
- ii) Explain with a diagram a lap armature windings of a d.c machine (4 marks)
- c) A d.c generator delivers 20.4 KW at 240V to a resistance load. The resistance of the armature is 0.125Ω and the resistance of the field winding is 80Ω . Assuming a total brush contact drop of 2V, calculate
- i) The current in the armature
 - ii) The generated emf (5 marks)
4. a) With the aid of a load characteristics curve describe the operation of a shunt – type d.c generator (6 marks)
- b) Describe with a diagram a face plate starter for d.c shunt motor with overload and no voltage protective device (8 marks)
- c) A separately excited generator develops a no- load emf of 200V for an armature speed of 10rev/s and a flux per pole of 0.15 Wb . Determine the generated emf when
- i) The speed is increased to 12rev/s, the pole flux remaining unchanged
 - ii) The pole flux is decreased to 0.12 Wb, the speed being 10.rev/s
 - iii) The speed is increased by 10 percent and the flux is decreased by 5 percent (6 marks)
5. a) Derive from first principles the expression for the generated emf equation of a d.c machine (7 marks)

- b) Define the term 'commutation' with regard to a d.c machine (2 marks)
- c) Explain the method of improving commutation by means of interpoles in a d.c motor (5 marks)
- d) With the aid of a diagram describe the construction and operation of a split-phase induction motor. (6 marks)