



MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

SUPPLEMENTARY EXAMINATION

EED 204: ELECTRICAL MACHINES I

DATE: 28/8/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

Answer Question One and Any Other Two 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 a d.c motor magnetic field is given by the expression

$$T = \frac{p\phi I}{\pi}$$

Nm per conductor

where I = armature current per conductor in amperes

p = pole – pairs

ϕ = magnetic flux per pole in webers (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)