



MACHAKOS UNIVERSITY

University Examinations 2018/2019

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

EED 204: ELECTRICAL MACHINES I

DATE: 27/9/2019

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

This paper consists of FIVE Questions. Answer QUESTION ONE and ANY OTHER TWO questions.

QUESTION ONE (Compulsory)

- a) Enumerate the factors on which speed of a d.c motor depends. [4 marks]
- b) Define Armature reaction. [2 marks]
- c) With a neat diagram explain the Capacitor –Start Capacitor-Run Motor. [4 marks]
- d) State three types of single phase A.C motors and applications. [5 marks]
- e) Derive the efficiency of a D.C generator. [4 marks]
- f) A 220 V shunt motor has the following parameters: $R_a = 0.6 \Omega$, $R_F = 100 \Omega$ and rotational (core, mechanical and stray) losses are 50 W. On full load, the line current is 19.5 A and the motor runs at 1200 rpm, find:
 - i) The developed power. [4 marks]
 - ii) The output power. [3 marks]
 - iii) The output torque. [3 marks]

QUESTION TWO

- (a) Explain the principle of operation of a DC generator. [3 marks]
- (b) A shunt machine, connected to a 200V main has an armature resistance of $0.15\ \Omega$ and field resistance is $100\ \Omega$. Find the ratio of its speed as a generator to its speed as a motor, line current in each case being 75 A. [5 marks]
- (c) Describe with sketches the construction of a DC machine. [4 marks]
- (d) Derive the EMF equation of DC generator. [3 marks]

QUESTION THREE

- (a) Distinguish between shunt and series field coil construction. [1 mark]
- (b) Describe types of D.C. generator and their characteristics. [4 marks]
- (c) An 8-pole, wave-connected armature has 600 conductors and is driven at 625 rev/min. If the flux per pole is 20 mWb, determine the generated e.m.f. [5 marks]
- (d) A Determine the terminal voltage of a generator which develops an e.m.f. of 200 V and has an armature current of 30 A on load. Assume the armature resistance is $0.30\ \Omega$ [5 marks]

QUESTION FOUR

- (a) With a neat diagram, explain the working principle of Capacitor-Start Motor. [5 marks]
- (b) State and explain two types of windings in DC machines [5 marks]
- (c) A short-shunt compound generator supplies 80 A at 200 V. If the field resistance, $R_f = 40\ \Omega$, the series resistance, $R_{se} = 0.02\ \Omega$ and the armature resistance, $R_a = 0.04\ \Omega$, determine the e.m.f generated. [5 marks]

QUESTION FIVE

- (a) State and explain types of DC Motors. [3 marks]
- (b) A 10 kW shunt generator having an armature circuit resistance of 0.75Ω and a field resistance of 125Ω generates a terminal voltage of 250 V at full load. Determine the efficiency of the generator at full load, assuming the iron, friction and windage losses amount to 600 W. [5 marks]
- (c) Derive the expression for efficiency of D.C. machines. [3 marks]
- (d) State types of losses in D.C machines. [4 marks]