



**COLLEGE OF ENGINEERING, SCIENCE &
TECHNOLOGY**

SCHOOL OF MECHANICAL ENGINEERING

TRADE DIPLOMA IN RENEWABLE ENERGY

EEE566-ELECTRICAL MACHINES DRIVES and CONTROLS

FINAL EXAMINATION – TRIMESTER 1 -2017 DURATION: 3 HOURS

INSTRUCTIONS TO STUDENTS:

1. You are allowed 10 minutes extra reading time during which you are not allowed to write.
2. Begin each **SECTION** on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each answer sheet.
4. Insert all foolscaps, graph paper, drawing paper etc in their correct sequence and secure with string.
5. For all sheets of paper on which rough / draft work has been done, cross it through and you must attach to the answer booklet.
6. Write clearly the number(s) of the question(s) attempted on top of each sheet.
7. **ATTEMPT ALL QUESTIONS**

SECTION A

(40 MARKS)

1. Identify the different five (5) types of dc machines, classified according to how their field flux is created. (5 marks)
2. Draw any two types of dc machines and outline their characteristics. (8 marks)
3. Calculate the input power and the efficiency of a dc brush permanent magnet motor supplying a 0.445 kW load at a speed of 675 rpm with a required torque of 6.2 Nm when supplied with 12 V at 45 A input. (6marks)
4. With the aid a diagram outline the principles of action of a transformer. (4 marks)
5. With the aid of a diagram outline the principles of an induction motor. (4 marks)
6. Discuss the paralleling requirements of transformers. (3 marks)
7. With the aid of a diagram outline the current – voltage characteristics for a silicon and a germanium diode. (3 marks)
8. Draw a fully labeled equivalent circuit of a transformer. (5 marks)
9. Draw fully labeled diagrams of P-N-P transistor showing the structure and symbol. (2 marks)

SECTION B

(60 MARKS)

1. A dc motor takes an armature current of 110 A at 480 V. The resistance of the armature circuit is 0.2 Ω . The machine has 6 poles and the armature is lap – connected with 864 conductors. The flux per pole is 0.05 Wb. Calculate:
 - (a) The speed
 - (b) The gross torque developed by the armature. (10 marks)
2. (a). Name and draw the four most common methods of connecting the primary and secondary windings of a three phase transformer. (4 marks)
 - (b). If a 415 V, three phase transformer has 200 turns per phase on the primary windings and 40 turns on the secondaries, find the output line voltage for each of the main types of connection. (6 marks)
3. (a). Name the six (6) single phase motors that you know of. (6 marks)
 - (b). Calculate the speed of a 4-pole single phase motor if the slip at full load is 3.4 %. The line frequency is 50 Hz. (6 marks)
 - (c). Draw a fully labeled equivalent circuit of a single phase motor. (3 marks)
4. (a) List the main components of a dc machine. (6 marks)
 - (b) With the aid of fully labeled diagrams to show the electrical connection, and motor characteristics explain how a shunt motor operates. (7.5 marks)
 - (c) Explain how the reversal of rotation is achieved. (1.5 marks)
5. With the aid of fully labeled diagrams outline the action of a full – wave bridge rectifier. (10 marks)

The End