



COLLEGE: COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: TRADE DIPLOMA IN ELECTRICAL ENGINEERING - STAGE 3

UNIT CODE: EEE467

TITLE: ELECTRICAL PRINCIPLES

## FINAL EXAMINATION – TRIMESTER 3, 2015

ROOM: AS PER TIMETABLE

### INSTRUCTIONS TO STUDENTS

1. You are allowed 10 minutes extra reading time during which you are NOT 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 attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and ATTACH these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
8. ANSWER ALL QUESTIONS
9. Show all working where necessary.
10. ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE EXAM ROOM.

- 1) A machine producing a voltage with an alternating waveform at its terminals is called an alternator. Name the two types of alternator rotor. (2 marks)
- 2) Explain in detail what iron loss is with an example. (3 marks)
- 3) Explain two ways in which alternator emf can be increased. (3 marks)
- 4) A circuit in which self-induced voltages occur is said to have the property of self-inductance. State three factors on which the value of induced voltage in general depends on. (3 marks)
- 5) Draw the relative movement of a conductor in a magnetic field as the current increases and relative movement of a conductor in a magnetic field as the current decreases. (8 marks)
- 6) List four effects of low power factor. (4 marks)
- 7) A resistor  $20\Omega$ , inductor  $0.12\text{H}$  and capacitor  $10\mu\text{F}$  are all connected in series across a  $240\text{V}$   $50\text{Hz}$  supply. Find the voltage drop across each component and the total current. (7 marks)
- 8) An alternator is capable of supplying  $10\text{KVA}$  through a  $415\text{ V}$   $50\text{Hz}$  supply at power factor of  $0.9$ . Find the efficiency of the alternator given a copper and iron loss of  $150\text{W}$  and  $300\text{W}$  respectively. (4 marks)
- 9) Name the three types of transformers. (3 marks)
- 10) What are the causes of low power factor. (2 marks)
- 11) A  $10\text{ H}$  choke with a resistance of  $15\text{ ohms}$  has a current flowing through it of  $5\text{A}$ . Find:
  - a) the time constant of the choke. (2 marks)
  - b) the energy stored in the magnetic field. (2 marks)
- 12) An inductor of  $0.05\text{ H}$  has a current flowing through it of  $2\text{A}$ . If the current is reduced to zero in one millisecond, find the induced voltage across the terminals. (2 marks)
- 13) What are the advantages of using a three phase system over single phase. (4 marks)
- 14) What is the purpose of using a neutral conductor in an unbalanced system. (2 marks)
- 15) An alternator can be considered to consist of three components in series. Name these three components. (3 marks)

- 16) A three phase 415V, 50Hz star connected system is connected across three resistors of values 5Ω, 10Ω and 15Ω respectively. Each resistor is connected across each phase. Find
- each of the phase current (4 marks)
  - total power consumed by the system (6 marks)
- 17) Describe the operating principle of a transformer. (2 marks)
- 18) Draw a diagram showing how copper losses are measured in a transformer. (4 marks)
- 19) A delta connected three phase transformer of 415V, 50Hz supply has 100 turns on primary winding and 600 turns on secondary winding. Find the output phase voltage and the output phase current if the output is connected to a delta load. (6 marks)
- 20) How does a PT works and give examples of this. (2 marks)
- 21) Explain the relationship between the voltages and number of turns of the two windings of a transformer. (2 marks)
- 22) What is meant by the term leakage flux and how is it kept to a minimum? (3 marks)
- 23) Describe the phase shifts of the four main transformer connections. (6 marks)
- 24) A coil has an inductance of 0.05 H. What would be the inductive reactance at a frequency of:
- 25 Hz (2 marks)
  - 50 Hz (2 marks)
  - at what frequency would it have a reactance of 10 ohms. (2 marks)
- 25) Name the two main windings of the three phase synchronous machine. (2 marks)
- 26) Name the three basic factors by which an alternator can be rated. (3 marks)

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