



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

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: CERTIFICATE IV IN ELECTRICAL ENGINEERING-STAGE 4

UNIT CODE: EEE444

TITLE: ELECTRICAL PRINCIPLES (TRADE) 3

FINAL EXAMINATION – PENSTER 2, 2016

ROOM: AS PER TIMETABLE

TIME: 2 HOURS 10 MINUTES

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.**

SECTION A

[20 MARKS]

1.0 The input power to a 3-phase A.C motor is measured as 5kW. If the voltage and current to the motor are 400V and 8.6A respectively, determine the power factor of the system.

(5 marks)

2.0 A motor takes a current of 9 A at 0.75 power factor, lagging, from a 250 V 60 Hz supply. What size of capacitor is required to improve the power factor to 0.9 lagging?

(5 marks)

3.0 If a 2 kW load is connected to a 240 V A.C supply, find the current flowing at:

- a) Unity power factor
- b) Power factor = 0.9
- c) Power factor = 0.45

(4 marks)

4.0 A 415V, 3 phase A.C motor has a power output of 12.75kW and operates at a power factor of 0.77 lagging and with an efficiency of 85%. If the motor is delta connected, determine:

- a) The power output.
- b) The line current.
- c) The phase current

(6 marks)

SECTION B

[20 MARKS]

1. Briefly explain the effects of unbalanced loads in a three phase system.
(4 marks)
2. Draw the diagram of a three wattmeter (four wire system) and write down its advantages and disadvantages.
(6 marks)
3. A three phase, four wire load has its power input measured by three wattmeters. The first reading is 2.7 kW, the second 8.7 kW and the third 9.3 kW. Find the total power consumed.
(3 marks)
4. Two wattmeters connected to a 3-phase motor indicate the total power input to be 12kW. The power factor is 0.6. Determine the readings of each wattmeter.
(5 marks)
5. State what happens due to the presence of resonance in electrical circuits.
(2 marks)

SECTION C

[30 MARKS]

1. A 20Ω resistor is connected in parallel with an inductor of 2.387 mH are across a 60V , 1 kHz supply. Calculate:

- 1) The current in each branch.
- 2) The supply current.
- 3) The circuit phase angle.
- 4) The circuit impedance.
- 5) The power consumed.

(10 marks)

2. Explain the differences between star and delta systems.

(4 marks)

3. A $30\mu\text{F}$ capacitor is connected in parallel with an 80Ω resistor across a 240V , 50Hz supply. Calculate:

- a) The supply current.
- b) The circuit phase angle
- c) The circuit impedance.
- d) The power dissipated.
- e) The apparent power.

(10 marks)

4. Explain some causes of low power factor in an electrical installation?

(3 marks)

5. Briefly explain effects of phase reversal on a three phase Star System?

(3 marks)

SECTION D

[30 MARKS]

1. Draw and explain the operation of a full-wave bridge rectifier circuit with input and output waveforms.
(10 marks)

2. Draw and explain a typical arrangement for generation and supply of electrical power.
(10 marks)

3. A 400V, 3-phase star connected alternator supplies a delta-connected load, each phase of which has a resistance of 30Ω and inductive reactance 40Ω . Calculate
 - a) The current supplied by the alternator.
 - b) The output power and the kVA of the alternator, neglecting the losses in line between the alternator and load.(10 marks)

***** **The End** *****