



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

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: CERTIFICATE IV IN ELECTRICAL ENGINEERING-STAGE 3

UNIT CODE: EEE391

TITLE: ELECTRICAL PRINCIPLES (TRADE) 2

FINAL EXAMINATION – PENSTER 3, 2017

**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 Draw the circuit diagram for the following

1.1 Purely Resistive

1.2 Purely Capacitive

1.3 Purely Inductive

(3 marks)

2.0 If a 1kW load is connected to a 240 V a.c supply, find the current flowing at:

2.1 Unity power factor

2.2 Power factor = 0.85

2.3 Power factor = 0.44

2.4 Sketch the phasors

(7 marks)

3.0 Write formulas for finding the impedance of a series R-L-C circuits.

(2 marks)

4.0 A series resonant circuit consists of $L = 100\text{mH}$, $C = 0.18\mu\text{F}$ and $R = 45\Omega$ is connected to a supply.

4.1 Calculate the frequency supply at resonance

4.2 What is the impedance value at resonance?

4.3 Calculate the current at resonance

(8 marks)

SECTION B

[20 MARKS]

1.0 1.1 A capacitor has a reactance of 40Ω when operated on a 50 Hz supply. Determine the value of its capacitance. (2 marks)

1.2 A coil of inductance 318.3mH and negligible resistance is connected in series with a 200Ω resistor to a 240V, 50 Hz supply. Calculate
(a) the inductive reactance of the coil,
(b) The impedance of the circuit,
(c) the current in the circuit,
(d) the p.d. across each Component, and
(e) the circuit phase angle. (5 marks)

2.0 A coil with an inductance of 0.4H. what would be the voltage required to produce a current at 5A of:

2.1 100Hz (3 marks)
2.2 200Hz (3 marks)

3.0 What would be the effect on the current if the supply frequency were halved and the voltage maintained the same value. (2 marks)

4.0 Explain what series resonance circuit is. (2 marks)

5.0 Give two methods that can be done to achieve resonance. (2 marks)

6.0 Give one danger if resonance occurs in electrical installation. (1 mark)

SECTION C

[30 MARKS]

1.0 A resistor of 10Ω and an inductor of 0.12H are connected in parallel to a 250V , 50Hz supply. Calculate:

- 1.1 The current flowing in the resistor (2 marks)
- 1.2 The current flowing in the inductor (2 marks)
- 1.3 The total current supply (2 marks)
- 1.4 The total impedance of the circuit (2 marks)
- 1.5 The power factor (3 marks)

2.0 For an R-L-C series circuit:

Which of the following quantities should be increased and which decreased to produce resonance if V_L is greater than V_C ?

- 2.1 Frequency (2 marks)
- 2.2 Inductance (2 marks)
- 2.3 Capacitance (2 marks)
- 2.4 Capacitive reactance (3 marks)

3.0 Explain what you understand about the term, power factor. (3 marks)

4.0 What are the two causes of low power factor in an electrical installation? (4 marks)

5.0 List three factors that affect the capacitance of a capacitor. (3 marks)

SECTION D

[30 MARKS]

- 1.0 A 400V alternator is supplying a load of 42kW at a power factor of 0.7 lagging.
Calculate (a) the kVA loading and
(b) the current taken from the alternator.
(c) If the power factor now raised to unity find the new kVA loading.
(6 marks)
- 2.0 List down five advantages of three phase connection. (5 marks)
- 3.0 Name two types of three phase connection (2 marks)
- 4.0 Three 12Ω resistors are connected in star to a 415V, 3-phase supply. Determine the total power dissipated by the resistors. (4 marks)
- 5.0 Three coils each having a resistance of 21Ω and an inductive reactance of 28Ω are connected in delta to a 415V, 3 phase supply. Determine:
- a) Phase current (3 marks)
 - b) Line current (3 marks)
 - c) Power factor (3.5 marks)
 - d) Total power (3.5 marks)

*****THEEND*****