



**COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY**  
**SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING**  
**CERTIFICATE 4 IN ELECTRICAL ENGINEERING-STAGE 3**  
**EEE 391 ELECTRICAL PRINCIPLES (TRADE) 2**  
**FINAL EXAMINATION – PENSTER 2, 2014**

**INSTRUCTIONS TO STUDENTS**

1. *You are allowed 10 minutes Extra reading time during which you are NOT to write.*
2. *Begin each answer 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, 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 your answer scripts.*
6. *Write clearly the number(s) of the question(s) attempted on top of each sheet.*
7. **ANSWER ALL QUESTIONS.**
8. *Show all workings where necessary.*
9. *Do not use programmable calculators, especially the ones that do the conversion of number systems.*
10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM.**

**SECTION A** (20 MARKS) BRIEFLY ANSWER THE QUESTIONS.

1. What are the three effects of varying proportions of resistance, inductance and capacitance on a.c. circuits? (3 marks)
2. Define impedance? (2 marks)
3. Explain the relationship of current and voltage in an a.c. series R-L circuit. (2 marks)
4. What are the power losses in the winding and in the iron core of an inductor machine? (2 marks)
5. Define inductor power loss. (2 marks)
6. Briefly explain these terms, true power (P), apparent power (S) and reactive - power. (9 marks)

**SECTION B** (60 MARKS) CALCULATIONS

1. A series a.c. circuit contains the following components:  $R = 150$  ohms,  $L = 250$  mH,  $C = 2.0$  micro Farads and a generator  $V_{max} = 210V$  operating at  $40.0$  Hz. Calculate the followings:
  - a. Inductive reactance
  - b. Capacitive reactance
  - c. Impedance
  - d. Maximum current and
  - e. Phase angle(15 marks)
2. A 10 micro farads and a 5 micro farad capacitor were connected in series. What is the total capacitance? (3 marks)
3. A 300 micro-farad capacitor was charged and it has a potential difference of 40V. Calculate the charge on the plates. (2 marks)
4. An inductor coil specification is that it will draw 12 amperes at 240V d.c. and 6 amps at 240V a.c. What is the angle of lag on a.c.? (4 marks)

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5. Power input to a motor is 3 amps at a nominal voltage of 240V and the wattmeter Reading is 500W. What is the power factor? (3 marks)
6. A single phase motor draws 1150W from the supply of 240V, 50 Hz. A power factor meter reading for the circuit is 0.54. Determine the current taken from the supply. (3 marks)
7. A series circuit has a resistance of 20 ohms and an inductive reactance of 16 ohms. Determine the impedance of the circuit and the angle of phase difference. (6 marks)
8. Resistance and inductance in parallel have a 0.06 H inductance of the coil with negligible resistance is connected in parallel with a 30 ohm resistance. A voltage of 240V, 50 Hz is applied; find (a) the current (b) the power factor and (c) the power taken by the circuit. (8 marks)
9. A single phase pump draws 2.7 amperes, voltage is 240V and the wattmeter in the circuit reads 500 W, find the power factor. (3 marks)
10. A resistive is connected to an alternating supply. If the resistance is  $7.9 \Omega$  and the Voltage is 240V, calculate the current flow and the power consumed. (4 marks)
11. The maximum e.m.f. generated in alternator coil is 220V. Calculate  $v$  for the angles Of rotation: a)  $\theta = 30^\circ$ , b)  $\theta = 150^\circ$  and c)  $\theta = 310^\circ$ . (9 marks)

### **SECTION C (20 MARKS) SHORT ANSWER QUESTIONS.**

1. What is the combined opposition to current flow in an R – L circuit? (1 mark)
2. What is a common element in a series R – L circuit? (1 mark)
3. What is a common element in a parallel R – L circuit? (1 mark)
4. What is the power loss in the winding of a motor? (1 mark)
5. What are the causes of iron loss in a motor? (2 mark)
6. What is the effect of low power factor in any a.c. circuit? (1 mark)
7. What causes most power factor problems? (1 mark)

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8. What is the effect of correcting a power factor of a circuit which have inductive reactance and inductive capacitance. (1 mark)
9. Increasing resistance in an R – L circuit will increase the value of another component. What is the component? (1 mark)
10. What is the effect of e.m.f. and opposition to current flow of having inductors in series in an a.c. circuit? (2 marks)
11. What is the component in a series a.c. power circuit that lags the voltage by  $90^\circ$  (1 mark)
12. What is the unit of charge of a capacitor? (1 mark)
13. Derive power that is consumed by a pure capacitor. (1 mark)
14. What is the effect of current and voltage in a pure capacitance in an a.c. circuit? (1 mark)
15. What is a capacitor? (1 mark)
16. There are many types of capacitors, name one. (1 mark)
17. What is the value of power in a purely resistive circuit. (1 mark)
18. What type of circuit that has its total current equal to the phasor addition of  $I_R, I_L$  and  $I_C$  when L and C are pure quantities? (1 mark)

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