



COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

CERTIFICATE IV IN ELECTRICAL ENGINEERING-Stage 3

EEE444- ELECTRICAL PRINCIPLES (TRADE) 3

FINAL EXAMINATION – PENSTER 2, 2014

Day/Date: As per timetable Time: As per timetable 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 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 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 though and you MUST ATTACH to your answer scripts.*
6. *Write clearly the number(s) of the question(s) attempted on the top of each sheet.*
7. **ANSWER ALL QUESTIONS.**
8. *Show all workings where necessary.*
9. *Do not use programmable calculators, especially the ones that does the conversions of number systems.*
10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM!**

SECTION A (45 MARKS)

THREE PHASE CIRCUITS

1. Draw the three phase wave form from 0 – 360 degrees. (3 marks)
2. State the effects of broken neutral. (3 marks)
3. Compare the two types of three phase connections. Mention at least five (5) points in each case. (5 marks)
4. Show with diagrams two wattmeter (3 wire) method of power measurement in three phase system. Also give three advantages of this method. (6marks)
5. A 3 phase, 4-wire distribution system carried the following unbalanced loads:
Red Phase 45.0A at 10° lagging
White Phase 87.5A at 42° lagging
Blue Phase 62.5A at 27° lagging

Determine the current in the neutral wire (8 marks)
6. Give two functions of neutral conductor in a three phase four wire system. (4 marks)
7. A three phase machine is connected in Delta. If the line current is 5A each, find the phase current in each winding. (2 marks)
8. A 415V, three phase-four wire star connected system supplies three resistive loads of 24 kW, 18 kW and 12 kW determine the current in each line. (6marks)
9. Three identical coils, each with resistance of 12 ohms and inductance of 38mH are connected in star to a 415 volts 50 hertz three phase supply, calculate
 - a) Inductive reactance of each coil
 - b) Impedance of each phase
 - c) Phase current
 - d) Line current
 - e) Power (5 marks)
10. When connected to a three phase motor, two wattmeter's gave readings of 3 kW, and -1 kW, Calculate
 - a) Total power
 - b) Power factor, assuming balance load. (3 marks)

SECTION B (35 MARKS)

POWER FACTOR IMPROVEMENT

1. Explain why A.C machines are rated in K.V.A and not in K.W. (2 marks)

2. A factory installation has the following loads:
 - i) Incandescent lamps- 10kW
 - ii) Heater - 30kW
 - iii) Motor - 40Kva at p.f. of 0.8 lagging
 - a) Calculate the total active load in kW.
 - b) Calculate the total kVAr
 - c) Calculate the total kVA
 - d) Calculate the p.f. of the installation (8marks)

3. A welding plant set draws 50A from a 400V AC supply at a pf of 0.8 lagging.
Calculate:
 - a) the kVA of the plant
 - b) the power in kW (3marks)

4. Give four serious effects of low power factor on A.C supply system. (4 marks)

5. Give five advantages of power factor improvement. (5 marks)

6. The power being supplied to a factory is 2000kW and apparent power is 2050KVA,
Calculate the power factor. (2 marks)

7. If a 1Kw load is connected to a 230 V a.c supply, find the current flowing at:
 - a) The power factor is 0.92
 - b) The power factor is 0.36
 - c) The power factor is unity (3 marks)

8. Power factor of a 115V, 60Hz motor when taking full load current of 80A is 0.707 find:
 - a) the supply current when p.f. is corrected to unity.
 - b) current taken by the capacitor used for p.f. correction.
 - c) the Reactance of the capacitor.
 - d) the capacitance of the capacitor (8 marks)

SECTION C (20 MARKS)

RECTIFIERS

- 1) Draw the circuit diagram of the following rectifier circuits, giving the input and output waveforms.
 - a) Single phase half wave
 - b) Single phase bridge
 - c) Three phase full wave bridge (12 marks)

- 2) In a single phase full wave centre-tap rectification, the AC voltage is 46 volts at 50 hertz and load resistance of 7 ohms, Calculate,
 - a) The load voltage
 - b) The load current
 - c) The ripple voltage
 - d) The ripple frequency
 - e) The PRV. (8 marks)