



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

**SCHOOL OF ELECTRICAL & ELECTRONICS
ENGINEERING**

CERTIFICATE IV IN ELECTRICAL ENGINEERING - STAGE 4

EEE444 - ELECTRICAL PRINCIPLES (TRADE) 3

FINAL EXAMINATION – PENSTER 3, 2014

DATE/DAY:

TIME:

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 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. Attempt **ALL** questions in all Sections

8. One method of increasing power factor of loads is to install:

A. watt meters

B. capacitors banks

C. resistors

D. Inductors

9. A single phase half- wave rectifier is used in:

A. transformers

B. line

C. high power applications

D. low power applications

10. In a three phase system the phases are designated by colors:

A. red, white, black

B. blue, white, black

C. red, black, brown

D. red, white, blue

3 PHASE SYSTEMS

1. State 3 advantages of three-phase power over single phase power. **(3 marks)**
2. Draw the 3-phase AC (sine) waveform. **(3 marks)**
3. A three-phase, star connected alternator supplies a delta connected induction motor at a line voltage of 600V. The current in each line is 40A. Find:
 - a) The phase voltage of the alternator
 - b) The current in each phase of the motor **(4 marks)**
4. Give two functions of neutral conductor in a three phase four wire system. **(2 marks)**
5. Three identical coils, each with resistance of 10 ohms and inductance of 42 milli henry 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) Power factor
 - e) Power **(8 marks)**
6. An 11kV three-phase alternator supplies a balanced load with 400A in each line, the current lagging 38° behind the line voltage. Determine the power output. **(3 marks)**
7. A three-phase, four wire distribution system carried the following unbalanced loads:
 - Red phase - 40A at 45° lagging
 - White phase - 50A at 30° lagging
 - Blue phase - 60A at 20° laggingDetermine the current in the neutral wire. **(10 marks)**
8. Explain two methods of three phase power measurement, also list down one advantage and one disadvantage for each. **(4 marks)**
9. Compare star and delta connected systems. Also draw fully labeled diagram showing line and phase voltages and currents. **(3 marks)**

POWER FACTOR IMPROVEMENT

1. Explain why A.C machines are rated in kVA or MVA and not in kW or MW. **(3 marks)**
2. Give five serious effects of low power factor on A.C supply system. **(5 marks)**
3. State 2 methods of power factor improvement. **(4 marks)**
4. The power being supplied to a factory is 800kW and apparent power is 1000kVA, calculate the power factor. **(3 marks)**
5. A single phase 230 volts A.C generator delivers a power of 3kW. Calculate the current when
 - a) The power factor is 0.5
 - b) The power factor is unity**(5 marks)**
6. Power factor of a 115 volts, 60 hertz motor when taking full load current of 80 amps is 0.707, calculate
 - a) The supply current when power factor is improved to unity.
 - b) Capacitor current to improve power factor to unity.
 - c) Reactance of the capacitor
 - d) Capacitance of the capacitor**(12 marks)**
7. A welding plant set draws 30A from a 400V AC (single phase) supply at a pf of 0.5 lagging.
Calculate:
 - a) its kVA
 - b) its power in kW
 - c) its reactive power in kVAr
 - d) Determine the kVAr rating of a capacitor that will improve the pf to 0.9 lagging**(8 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 full wave bridge rectifier
 - c) Three phase half wave
- (10 marks)**

THE END