FIJI NATIONAL UNIVERSITY

COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

CERTIFICATE IV IN ELECTRICAL ENGINEERING-STAGE 4
EEE444- ELECTRICAL PRINCIPLES (TRADE) 3

FINAL EXAMINATION – PENSTER 4, 2015

TIME: 2HOURS 10MINUTES
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 do the conversions of number systems.

*10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM!***

SECTION A **[25 MARKS]**

1. A motor takes a current of 10 A at 0.65 power factor, lagging, from a 240 V 50 Hz supply. What size of capacitor is required to improve the power factor to 0.9 lagging?

(5 marks)

2. If a 1 kW load is connected to a 250 V a.c supply, find the current flowing at:
   a) Unity power factor ($\Theta = 0°$)
   b) Power factor = 0.8 ($\Theta = 37°$)
   c) Power factor = 0.4 ($\Theta = 66°$)

(6 marks)

3. A series resonant circuit consists of L = 100mH, C = 0.18μF and R = 45Ω is connected to a supply.

   a) Calculate the resonant frequency
   b) What is the impedance value at resonance?
   c) Calculate the current at resonance given v = 240 V

(6 marks)

4. Draw the diagram of a three wattmeter (four wire system) and write down its advantages and disadvantage.

(6 marks)

5. What care must be taken if two batteries are connected in parallel?

(2 marks)

SECTION B **[45 MARKS]**

1. Give two methods that can be done to achieve resonance. (3 marks)

2. 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)

3. A resistor of 8Ω and an inductor of 0.12H are connected in parallel to a 240V, 50Hz supply. Calculate:

   a) The current flowing in the resistor (2 marks)
   b) The current flowing in the inductor (2 marks)
   c) The total current supply (3 marks)
   d) The total impedance of the circuit (2 marks)
   e) The power factor (3 marks)

4. Explain the differences between star and delta systems. (4 marks)

5. What are the effects of a broken neutral? (4 marks)

6. What are the effects of phase reversal on a three phase Star System? (3 marks)

7. 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)

8. Draw the three phase waveform from 0 – 360 degrees. (3 marks)

SECTION C **[30 MARKS]**

1. Three coils each having resistance 3Ω and inductive reactance 4Ω are connected (i) in star and (ii) in delta to a 415V, 50Hz, 3 phase supply. Calculate for each connection (a) the line and phase voltages and (b) the phase and line currents.

(10 marks)

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

(10 marks)

3. The power being supplied to a factory is 900kW and apparent power is 1100kVA, calculate the power factor. (2 marks)

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

THE END