FIJI NATIONAL UNIVERSITY

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

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: CERTIFICATE IV IN ELECTRICAL ENGINEERING-STAGE 4

UNIT CODE: EEE444

TITLE: ELECTRICAL PRINCIPLES (TRADE) 3

FINAL EXAMINATION – PENSTER 4, 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 THREE PHASE CIRCUITS (45 MARKS)

1. List four advantages of a three phase system. (4 marks)

2. State the effects of phase reversal on a three phase star system. (3 marks)

3. Explain the differences between star and delta connections. Mention at least five (5) points in each case. (5 marks)

4. Show with the aid of a neat diagram two wattmeter method of measuring power in a three phase system. (6 marks)

5. A three-phase, four-wire distribution system carried the following unbalanced loads.

   Red Phase 120 A at power factor (λ) = 0.79 lagging
   White Phase 147 A at power factor (λ) = 0.85 lagging
   Blue Phase 215 A at power factor (λ) = 0.80 lagging

   Determine the current in the neutral wire by drawing a scaled phasor diagram of this loading. (10 marks)

6. Briefly explain the effects of an open-circuited neutral. (3 marks)

7. Three identical coils, each with resistance of 11 ohms and inductance of 25mH 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 (10 marks)

8. Readings taken by the two-wattmeter method for measuring power are: W_1,11.7KW; W_2,15.3 KW. Find
   a) Total power consumption
   b) Power factor, assuming balance load. (4 marks)

SECTION B POWER FACTOR IMPROVEMENT (35 MARKS)

1. Draw the Power Triangle and explain the terms real power, apparent power and reactive power for ac circuits and also the units used.

   (3 marks)

2. A welding plant set draws 25A from a 410V AC supply at a pf of 0.6 lagging.

   Calculate:

   a) the kVA of the plant
   b) the power in kW
   c) the reactive power in kVAr
   d) determine the kVAr rating of a capacitor that will improve the pf to 0.9 lagging
   e) what current will be drawn from the supply by the corrected circuit

   (10 marks)

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

4. How adding capacitor in parallel with a load does improves power factor. (2 marks)

5. The power factor of a circuit can be obtained by using a voltmeter,ammeter and wattmeter. Draw a circuit diagram for finding the power factor of a single phase ac motor. (5 marks)

6. The power being supplied to a factory is 1100KW and apparent power is 1300KVA, calculate the power factor. (2 marks)

7. If a 2Kw load is connected to a 250 V a.c supply, find the current flowing at:

   a) The power factor is 0.9
   b) The power factor is 0.3
   c) The power factor is unity (3 marks)

8. A motor takes a current of 10 A at 0.65 power factor, lagging, from a 240 V 50 Hz supply. Calculate the size of capacitor required to improve the power factor using a scaled phasor diagram. (6 marks)

SECTION C **RECTIFIERS** **(20 MARKS)**

1) Draw the circuit diagram of Single Phase Full-wave Bridge Rectifier AND three phase single way bridge rectifier.

(6 marks)

2) List down two protection required by SCR. (2 marks)

3) Outline the effects of open and short circuit on diodes.

(4 marks)

4) In a single phase full wave centre-tap rectification, the AC voltage is 120 volts at 50 hertz and load resistance of 12 ohms,
Calculate,
   a) The load voltage
   b) The load current
   c) The ripple voltage
   d) The ripple frequency
   e) The PRV. (8 marks)

THE END