FNU FIJI NATIONAL UNIVERSITY

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

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: CERTIFICATE IV IN ELECTRICAL ENGINEERING

UNIT CODE: EEE329

TITLE: ELECTRICAL PRINCIPLES (TRADE) 1

FINAL EXAMINATION – TRIMESTER 1, 2014

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.**

1. Find the impedance, current and power factor of the following series circuits and draw the corresponding phasor diagrams i) R and L ii) R and C iii) R, L and C. In each case the applied voltage is 200volts and the frequency is 50Hz. R = 10 W, L =50 mH, C= 100 µF. (6 marks)

2. Define the following terms and give examples of each:
   a) Molecules (1.5marks)
   b) Matter (1.5marks)

3. State how many atoms are contained in each of the following molecule?
   a) H 0 (1mark)
   b) H SO (1marks)

4. Draw the principle parts of an atom? (2marks)

5. For the circuit shown below calculate:
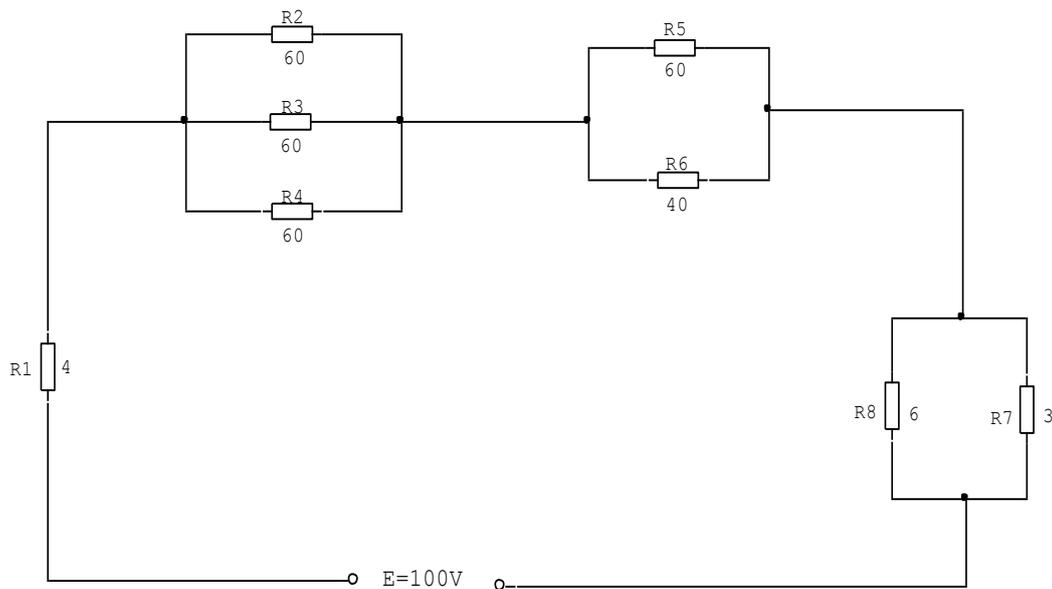
   a) Total resistance of the circuit (2 marks)
   b) Total current of the circuit (1 mark)
   c) Total power consumption by the circuit (1 mark)
   d) Current through R_2 (2 marks)
   e) Power dissipated through R_2 (1 mark)

1. A power supply is having the following loads:

Type of load	Max. demand (kW)	Diversity of group	Demand factor
Domestic	1500	1.2	0.8
Commercial	2000	1.1	0.9
Industrial	10,000	1.25	1

   If the overall system diversity factor is 1.35, determine the maximum demand and connected load of each type. (4 marks)

2. A series R-L-C circuit consists of a 100Ω resistor, an inductor of 0.318H and a capacitor of unknown value. When the circuit is energised by $230\angle 0º$ V, 50 Hz sinusoidal a.c. supply, the current is found to be $2.3\angle 0º$ A. Find

   i.   value of capacitor in microfarad.
   ii.   voltage across the inductor.
   iii. total power consumed. (3 marks)

3. Explain how Biofuels can be used to produce electricity. Also draw the biomass cycle. (5 marks)

4. Determine the value of the following resistors using color code   (4 marks)
   a) Red red black gold
   b) brown green black yellow red
   c) Blue red black brown brown
   d) Grey orange black orange red

5. Determine the value of the following resistors using color code   (4 marks)
   a) 2.7kΩ ± 2% (5 band)
   b) 3.9Ω ± 5%   (4 band)

1. Explain the basic construction and working principle of a single-phase transformer.
    (4 marks)

2. If a 1kW load is connected to a 250 V a.c supply, find the current flowing at:
    a. Unity power factor
    b. Power factor = 0.8
    c. Power factor = 0.4
    d. Sketch the phasors (4 marks)

3. What are the disadvantages of low power factor? How can it be improved? (4 marks)

4. 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 (1 mark)
    b. The current flowing in the inductor (2 marks)
    c. The total current supply (1 mark)
    d. The total impedance of the circuit (1 mark)
    e. The power factor (1 mark)

5. Find the total capacitance value of a 1μF, 68μF and 220μF capacitors if it is connected in
    a. Series
    b. Parallel
    c. Find the Total charge in series and in parallel given a voltage of 50V
    (4 marks)

6.
    a. What is a Thermostat and what is it used for? (2 marks)
    b. What is a Thermistor and what is it used for? (2 marks)
    c. What are Thermocouples and what are they used for? (2 marks)

7. What is the basic principle of a right hand screw rule and Fleming's right hand rule indicates using diagrams. (2 marks)

SECTION D [30 MARKS]

1. Explain the terms real power, apparent power and reactive power for ac circuits and also the units used. (6 marks)

2. List down five advantages of three phase connection. (5 marks)

3. Name two types of three phase connection (2 marks)

4. Name the three factors which are required to produce an induced voltage.
   (3 marks)

5. Find the resistance of a copper cable 95m in length if it has a diameter of 2mm.

   The resistivity of copper is 1.72×10^{-8} Ωm. (3 marks)

6. Draw the typical arrangement setup for generation, transmission and distribution of three phase electrical power supply. (6 marks)

7. Draw the three wattmeters (three wire system) and give its advantages and disadvantages. (5 marks)

THE END