



**FIJI NATIONAL UNIVERSITY**

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

**SCHOOL: ELECTRICAL & ELECTRONICS ENGINEERING**

**PROGRAMME: CERTIFICATE IN ELECTRICAL SERVICEMAN'S COURSE**

**UNIT CODE: EEE211**

**TITLE: APPLIED ELECTRICITY 1**

**FINAL EXAMINATION – PENSTER 1, 2017**

**TIME: 2 HOURS 10 MINUTES**

**DAY/DATE: TBC/TBC TIME: TBC ROOM: TBC**

**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 string.
5. For all sheets of paper on which rough or draft work has been done, cross it through 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. Answers to all questions must be written in **INK** on the Answer sheet provided and show all working where necessary.
8. Only Non-programmable calculators are allowed.
9. **ATTEMPT** all questions.

## **SECTION A (20 MARKS)**

In each of the following statements, one of the suggested answers is correct. Write your identified answer alphabet beside the question numbering in your answer sheet.

### **MULTIPLE CHOICE**

1. In the structure of the atom the negatively charged particle is the:
  - a. electron
  - b. proton
  - c. neutron
  - d. nucleus
  
2. If an atom has more electrons than protons then that atom becomes:
  - a. negatively charged
  - b. positively charged
  - c. no charge
  - d. neutralized
  
3. The smallest units into which an element can be divided and still have all the physical and chemical characteristics of the element are called:
  - a. conductor
  - b. atom
  - c. semiconductor
  - d. molecule
  
4. The smallest particle into which any particular matter can be divided without changing the characteristics of that matter is called what?
  - a. conductor
  - b. atom
  - c. semiconductor
  - d. molecule
  
5. Which one of the following describes the process by which an originally neutral atom becomes charged by the removal of electrons and the atom itself becomes an ion:
  - a. Ionisation
  - b. mixture
  - c. molecule
  - d. nucleus

6. What is composed of molecules made up of different atoms?
- watts
  - matter
  - amperes
  - joules
7. A positively charged body has more?
- electrons
  - protons
  - nucleus
  - None of the above
8. As the material rises in temperature, the molecules and their associated electrons gain energy. This extra energy is transferred through the material by means of collisions between electrons. This is best described as?
- Ionization
  - Convection
  - Radiation
  - Conduction
9. Which of the following offers high opposition to heat energy flow?
- copper
  - aluminum
  - wood
  - gold
10.  $R_T = R_1 + R_2 + R_3 + \dots$  this formula is adding total resistance of a circuit. This formula is for which type of circuit?
- Parallel circuit
  - Combination circuit
  - Series circuit
  - All of the above.
11. Which of the following gives the total resistance of a circuit when a  $25\Omega$  resistor and a  $5\Omega$  resistor are connected in a parallel?
- $20/30\ \Omega$
  - $6/25\Omega$
  - $25/6\Omega$
  - $30/20\Omega$ .

12. Cells that cannot be recharged by reversing the chemical changes that have taken place in them are which type of cells.
- Secondary cells
  - Primary cells
  - Both a and b mention above
  - None of the above
13. The chemical change that takes place on discharge can be reversed by applying the voltage to the cell and recharging it and the plates are restored to their original chemical state, and the process can be repeated, describes which types of cells?
- Secondary cells
  - Primary cells
  - Both a and b mention above
  - None of the above
14. A Capacitor is a device that stores energy in the form of?
- Electro-magnetic force
  - Inductance
  - Electrical Charge
  - None of the above
15. A  $16\mu\text{F}$  capacitor and an  $8\mu\text{F}$  capacitor are connected in series. Find the resulting capacitance?
- $5.3\mu\text{V}$
  - $5.3\mu\text{H}$
  - $5.3\mu\text{C}$
  - $5.3\mu\text{F}$
16. The magnetic force between two conductors carrying current in the same direction causes what between the two conductors?
- Repulsion
  - Attraction
  - Capacitance
  - None of the above

17. What is the unit of inductance?
- Electro-magnetic force
  - Henry
  - Capacitance
  - None of the above
18. Calculate the capacitive reactance of a  $16\mu\text{F}$  capacitor when connected to a 240V 50Hz supply.
- $5.3\mu\text{V}$
  - $5.3\mu\text{H}$
  - $198.9\mu\text{C}$
  - $198.9\Omega$
19. A coil has an inductance of 0.05 H. what would be the inductive reactance when connected to a 240V 50 Hz supply
- 15.7 A
  - 0.006 volts
  - 15.7 ohms
  - 0.006 coulombs
20. 1 kWhr equals?
- 3,600,000J
  - 1,000 J
  - 1,000 watts
  - 3.6 watts

**SECTION B (15 MARKS)**

Write down the question numbers in your answer booklet and beside it write the word(s) from the possible answer list provided that best completes the statement.

**Answer list:** Current, current flow, heat, voltage, One constant, magnetic force, negative, parallel, resistance, positive, repulsion, chemical effect, electrical effect,

- A If a positively charged body is connected to a negatively charged body, the electron flow will be from \_\_\_ 1 \_\_\_ to the \_\_\_ 2 \_\_\_ body.
- B Ammeters are connected in a circuit to measure the amount of \_\_\_ 3 \_\_\_ flow.
- C Voltmeters are connected in a circuit to measure the amount of \_\_\_ 4 \_\_\_\_\_.  
Voltmeters are connected in \_\_\_ 5 \_\_\_\_\_.
- D In a series circuit there is \_\_\_ 6 \_\_\_ value of current throughout the circuit.

- E The voltage across a \_\_\_\_\_ 7 \_\_\_\_\_ section is constant across each resistor in that section.
- F Ohm meters are connected in a circuit to measure the amount of \_\_\_\_\_ 8 \_\_\_\_\_.
- G When you are heating water in a hot water kettle, this appliance consumes electrical energy and transforms into \_\_\_\_\_ 9 \_\_\_\_\_ energy.
- H Electrochemistry in general refers to two processes – one using electrical energy to create a \_\_\_\_\_ 10 \_\_\_\_\_, the other a chemical effect to create \_\_\_\_\_ 11 \_\_\_\_\_.
- I The magnetic force between two conductors carrying current in the opposite direction causes \_\_\_\_\_ 12 \_\_\_\_\_ between the two conductors.
- J The right hand thumb rule in a straight conductor shows that the thumb is pointing in the direction of \_\_\_\_\_ 13 \_\_\_\_\_. While the fingers points in the direction in which the \_\_\_\_\_ 14 \_\_\_\_\_ is acting.
- K. Power is product of voltage and \_\_\_\_\_ 15 \_\_\_\_\_.

**SECTION C** (10 MARKS)

Write down the question numbers in your answer booklet and beside it write the answers in either **true or false**

1. Ammeters are connected in parallel to measure the current.
2. Like charges repel each other. Unlike charges attract
3. Ohms law states that  $V = IR$
4. The flow of electrons in a conductor is the flow of current
5. Ohm meters are connected in series
6. Heat energy moves from high to low temperature levels
7. Thermal conductivity is the ability of a material to transmit heat by conduction
8. Energy is the potential to do work
9. Subdividing the water molecule produces two different materials called elements
10. The best conductors of heat are glass and wood

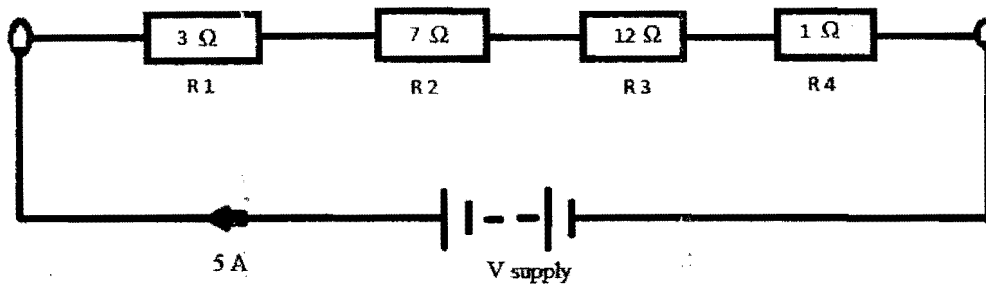
**SECTION D - MATCHING (15 MARKS)**

- |  |   |
|--|---|
| 1. Unit for voltage is                 | A. Causes electrons to flow in a circuit  |
| 2. Symbol for resistance is            | B. opposes current flow in a circuit.     |
| 3. Unit for Current is                 | C. forces current through circuit         |
| 4. Semi- conductor                     | D. $X_C = 1/(2\pi fC)$                    |
| 5. Positively charged body             | E. insulators at low temperature          |
| 6. Insulator                           | F. Volts                                  |
| 7. Current                             | G. Farad                                  |
| 8. Conductors                          | H. Secondary Cell                         |
| 9. Resistance                          | I. high opposition to flow of electricity |
| 10. Potential Difference               | J. Conducts electricity quite easily      |
| 11. Capacitive reactance               | K. Henry                                  |
| 12. Inductive reactance                | L. $\Omega$                               |
| 13. The unit charge for capacitance is | M. Ampere                                 |
| 14. What is the unit of inductance     | N. $X_L = 2\pi fL$                        |
| 15. Rechargeable cell                  | O. has more protons                       |

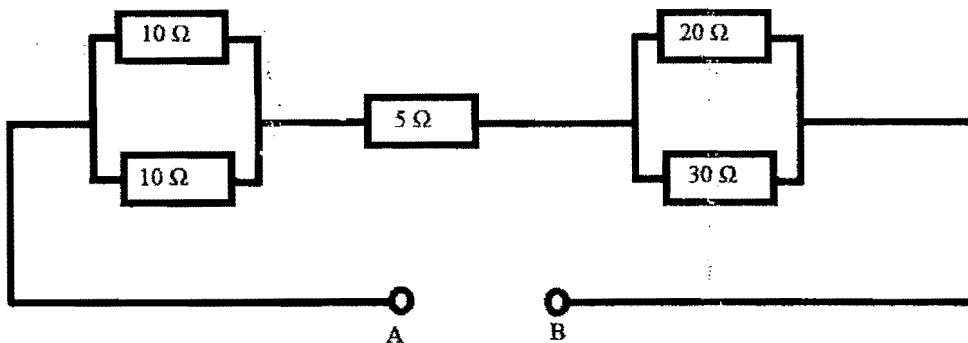
**SECTION E (40 MARKS)**

1. There are three recognized process of heat transfer. What are the names of these three processes? (3 marks)
2. There are four factors that affect the resistance of a conductor, what are these four factors? (4 marks)

3. Draw a negatively charge body, and sum the amounts of each charges in it? (2 marks)
4. In measuring temperature what two scales are used? (1 marks)
5. Magnetic reluctance is dependable on three factors; one is permeability of the circuit material. What are the remaining two factors? (2 marks)
6. What is the total voltage necessary to force a current of 5 A through the circuit shown below? (2.5 marks)



7. Find the total resistance between the terminals A and B in the circuit shown below (3 marks)

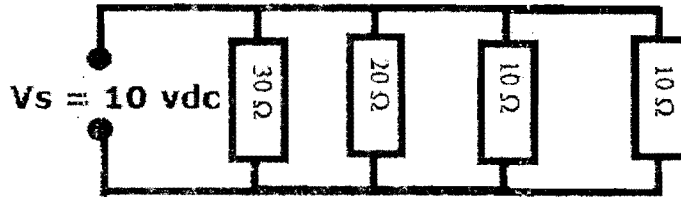




8. Calculate the following for the parallel circuit shown below.

- a. Total resistance
- b. Total current
- c. Total supplied power

( 4.5 marks )



9. A 100 watts street light stays on for 12 hours in the night; calculate its power consumption in kWhr. If the tariff rate is \$0.33c per kWhr, then what is the cost of electricity used? (4 marks)

10. It is desired to manufacture a  $15 \Omega$  resistor from  $0.2 \text{ mm}^2$  cross-sectional area manganin wire. What length is required?  $\rho = 48 \times 10^{-8} \Omega \text{ m}$  (4 marks)

11. Draw an Alternating Current with a maximum value of 10 amperes waveform over a period of  $360^\circ$  and calculate the following below mentioned values and identify these values on the same waveform (10 marks)

- a) Peak value ( $I_{pk}$ )
- b) RMS value ( $I_{rms}$ )
- c) Average values ( $I_{av}$ )

\*\*\*\*\**The End*\*\*\*\*\*