



**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 4, 2016**

**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 the identifying letters 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. no charge
  - b. positively charged
  - c. negatively charged
  - 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. 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
9. 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
10. Some car starter battery is lead acid cells. Which one of the following describes it.
- Secondary cells
  - Primary cells
  - Both a and b mention above
  - None of the above

11. Car starter battery is a lead acid cell which contains electrolyte. What instrument is used to test the electrolyte's specific gravity?
- Thermometer
  - Hydrometer
  - Ammeter
  - None of the above
12. An inductance coil has the property of inductance, in that it is designed to generate what?
- Electro-magnetic force
  - Resistance
  - Capacitance
  - None of the above
13. A Capacitor is a device that stores energy in the form of?
- Electro-magnetic force
  - Inductance
  - Electrical Charge
  - None of the above
14. 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
15. Right hand thumb rule for a solenoid shows that the fingers points in the direction of the current flowing through the coil and the thumb will point in the direction of what?
- South pole
  - North pole
  - Voltage flow
  - None of the above
16. A 12 V car battery requires 14.7 V to charge it at 20A. Find the internal resistance of the battery?
- 0.135  $\Omega$
  - 0.0135  $\Omega$
  - 0.0225  $\Omega$
  - 0.225  $\Omega$

17. If the same battery as mention in question 16 above has 6 cells, what is the internal resistance of each cell?
- 0.135  $\Omega$
  - 0.0135  $\Omega$
  - 0.0225  $\Omega$
  - 0.225  $\Omega$
18. A charge of 200 $\mu$ F capacitor has a potential difference of 30V. Calculate the charge on the plates?
- 0.006 A
  - 0.006 volts
  - 0.006 ohms
  - 0.006 coulombs
19. A 16 $\mu$ F capacitor and an 8 $\mu$ F capacitor are connected in series. Find the resulting capacitance?
- 5.3 $\mu$ F
  - 5.3 $\mu$ H
  - 5.3 $\mu$ C
  - 5.3 $\mu$ V
20. 1 kWhr equals?
- 3,600,000J
  - 1,000 J
  - 1,000 watts
  - 3.6 watts

**SECTION B Fill in the blanks (15 MARKS)**

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

- 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 True and False (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. A farad is the capacitance of a capacitor which stores a charge of one coulomb at a potential difference of one volt

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

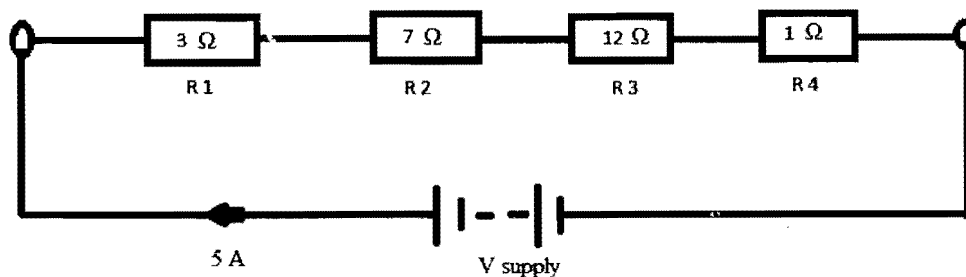
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|--|---|
| 1. Unit for voltage is                 | A. Causes electrons to flow in a circuit  |
| 2. Symbol for resistance is            | B. opposes current flow in a circuit.     |
| 3. Unit for Current is                 | C. forces current through 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 (15 MARKS)**

1. There are three recognized process of heat transfer. Mention any two of them. (2 marks)
2. There are the four factors that affect the resistance of a conductor, mention any three of them (3 marks)
3. Draw a negatively charge body, and sum the amounts of each charges in it? (2 marks)
4. Magnetic reluctance is dependable on three factors; one is permeability of the circuit material. What are the remaining two? (2 marks)
5. (a) A 240 volts household radiator has a resistance of  $23\Omega$ . Calculate the value of power drawn from the supply. (2 marks)  
  
(b) If the same radiator stays on for 2 hours, how much electrical energy would be used in kwh? (2 marks)  
  
(c) If the tariff rate is \$0.33c per kWh, then what is the cost of electricity used? (2 marks)

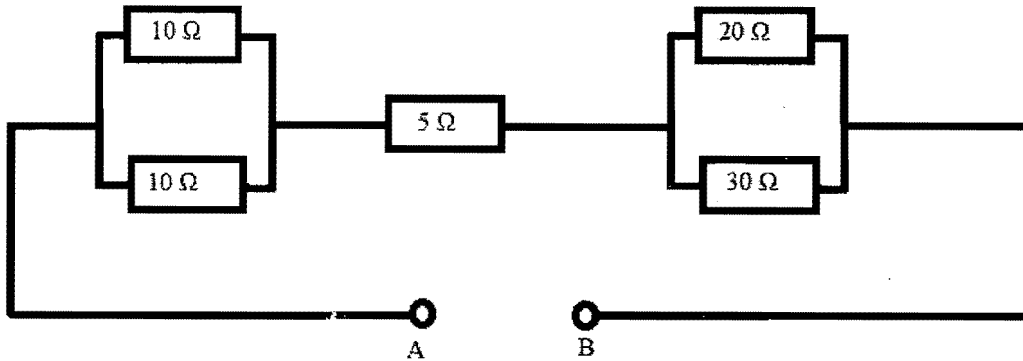
**SECTION F (25 MARKS)**

- 1 What is the total voltage necessary to force a current of 5 A through the circuit shown below? (3 marks)

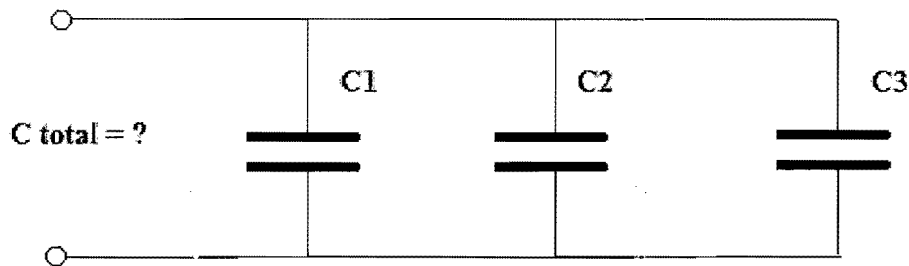




- 2 Find the total resistance between the terminals A and B in the circuit shown below (4 marks)



- 3 Three capacitors are connected in parallel in a dc circuit as shown, calculate the total capacitance when  $C_1$  is  $4\mu\text{F}$ ,  $C_2$  is  $8\mu\text{F}$  and  $C_3$  is  $12\mu\text{F}$ . (4 marks)



- 4 Draw an Alternating Current of 1 ampere's waveform over a period of  $360^\circ$  and show the following values: (8 marks)
- Peak value.
  - RMS value.
  - Average values

- 5 When the maximum value of an alternating current is 10A, Calculate the following:

- Average value? (2 marks)
- R.M.S. value? (2 marks)
- Peak value? (2 marks)

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