



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

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

CERTIFICATE III & IV IN ELECTRICAL ENGINEERING

UNIT CODE: EEC329

UNIT TITLE: ELECTRICAL TRADE PRINCIPLES I

FINAL EXAMINATION – QUARTER 3, 2019

ROOM: AS PER TIMETABLE

DURATION: 2 HOURS & 10 MINUTES

TOTAL MARKS: 100

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**MULTIPLE CHOICE****(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.

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 than 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 part of matter which can exist by itself and contains one or more atoms 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?
 - a. watts
 - b. matter
 - c. amperes
 - d. joules

7. A positively charged body has more?
 - a. electrons
 - b. protons
 - c. nucleus
 - d. None of the above

8. If the outer electrons of the atoms are loosely bound and free to move through the material.
- Ionization
 - Insulator
 - Radiation
 - Conductor
9. Most non-metallic solids which have extremely high resistance to the flow of charge through them are known as:
- copper
 - aluminum
 - insulator
 - semi-conductor
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 two 5Ω resistors are connected in a parallel?
- $20/30\ \Omega$
 - $5/2\ \Omega$
 - $25/6\Omega$
 - $30/20\Omega$.
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?
 - a. $5.3\mu\text{V}$
 - b. $5.3\mu\text{H}$
 - c. $5.3\mu\text{C}$
 - d. $5.3\mu\text{F}$
16. The magnetic force between two conductors carrying current in the same direction causes what between the two conductors?
 - a. Repulsion
 - b. Attraction
 - c. Capacitance
 - d. None of the above
17. What is the unit of inductance?
 - a. Electro-magnetic force
 - b. Henry
 - c. Capacitance
 - d. None of the above
18. In the Fleming's Right Hand Rule the middle finger points to the direction of:
 - a. flux
 - b. direction of current
 - c. positive Terminal
 - d. both b & c
19. If you apply the right hand thumb rule to a coil, the thumb points to the:
 - a. direction of current
 - b. south pole
 - c. north pole
 - d. out of page
20. 1 kWhr equals?
 - a. 3,600,000J
 - b. 1,000 J
 - c. 1,000 watts
 - d. 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) from the possible answer list provided that best completes the statement.

Answer list: Current, current flow, Nickel-cadmium cell, voltage, One constant, magnetic force, negative, parallel, resistance, positive, repulsion, strong, weak,

- 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 ____ circuit is constant across each resistor.
- F Ohm meters are connected in a circuit to measure the amount of ____ 8 ____.
- G Secondary cells are cells that can be recharged; one example of this type of cell is ____ 9 ____.
- H Where the lines of flux are dense, the magnetic field is ____ 10 ____, and where the lines of flux are sparse (far apart), the field is ____ 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/ 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 current is directly proportional to voltage and inversely proportional to resistance.
4. The flow of electrons in a conductor is the flow of current
5. Ohm meters are connected in series
6. Cells are connected in series to get higher voltage.
7. Cells are connected in series-parallel to get a higher power.
8. In a lead- acid battery the electrolyte is made of lead and water.
9. An electrical generator is a device that converts mechanical energy to electrical energy.
10. The best conductors of heat are glass and wood.

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

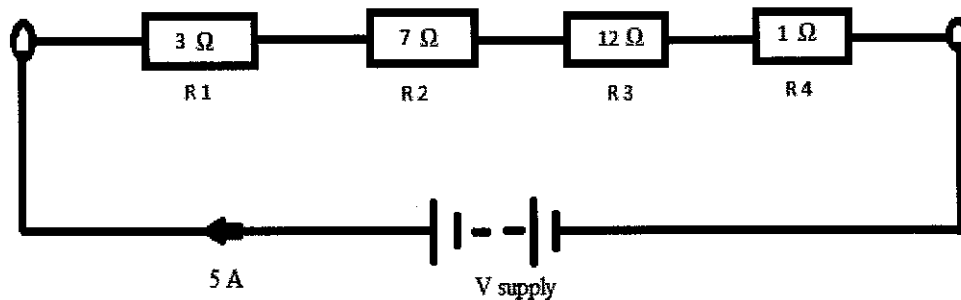
Write down the question numbers in your answer booklet and beside it write the matching alphabet.

- | | |
|------------------------------------|---|
| 1. Unit for voltage is | A. Coulomb |
| 2. Symbol for resistance is | B. opposes current flow in a circuit. |
| 3. Unit for Current is | C. is the height of waveform |
| 4. $V = IR$ | D. Hertz (Hz) |
| 5. Positively charged body | E. Ohm's Law |
| 6. Insulator | F. Volts |
| 7. Unit of charge is | G. Farad |
| 8. Conductors | H. Secondary Cell |
| 9. Resistance | I. high opposition to flow of electricity |
| 10. Amplitude | J. Conducts electricity quite easily |
| 11. Frequency | K. Henry |
| 12. Voltage of lead-acid cell | L. Ω |
| 13. The SI unit of capacitance is | M. Ampere |
| 14. What is the unit of inductance | N. 2.1 V |
| 15. Rechargeable cell | O. has more protons |

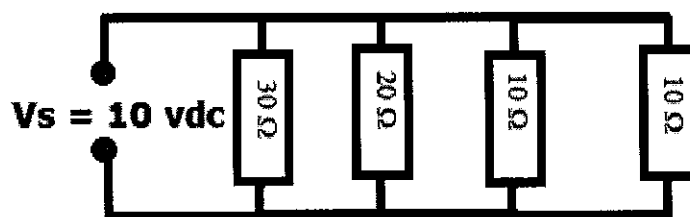
SECTION E**CALCULATION & SHORT ANSWER****(40 MARKS)**

- Calculate the value of the following capacitance using codes to the unit as stated in the brackets.
 - 104L [nF]
 - 224K [μ F](1 mark each)
- Find the resistance and tolerance or colour codes for the following resistors.
 - Brown, Red, Yellow, Gold
 - Brown, Black, Black, Silver
 - $100\Omega \pm 5\%$
 - $4.7K\Omega \pm 10\%$(Each question is worth 1 mark)

3. Calculate the resistance of a 2 km length of aluminium overhead power cable if the cross-sectional area of the cable is 100mm². Take the resistivity of aluminium to be $0.03 \times 10^{-6} \Omega/\text{m}$. (4 marks)
4. A magnetic pole face has a rectangular section having dimensions 200mm by 100mm. If the total flux emerging from the pole is 150 μWb , calculate the flux density? (3 marks)
5. A magnetising force of 8000A/m is applied to a magnetic circuit of 30cm by passing a current through a coil wound on the circuit. If the coil is uniformly wound around the circuit and has 750 turns, find the current in the coil. (3 marks)
6. Magnetic reluctance is dependable on three factors; one is permeability of the circuit material. What are the remaining two factors? (2 marks)
7. What is the total voltage necessary to force a current of 5 A through the circuit shown below? (2 marks)



8. Calculate the following for the parallel circuit shown below. (3 marks)
 - a. Total resistance
 - b. Total current
 - c. Total supplied power



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. Draw an alternating current with a maximum value of 10 amperes waveform over a period of 360° and calculate the following: (7 marks)

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

11. What's the capacitance of a polycarbonate capacitor with foil plates measuring 10mm by 2m, separated with a 0.1mm thick dielectric? $K = 4.5$ (6 marks)

******The End******
