



**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 2, 2019**

**ROOM: AS PER TIMETABLE**

**DURATION: 2 HOURS & 10 MINUTES**

**TOTAL MARKS: 100**

**INSTRUCTIONS TO STUDENTS**

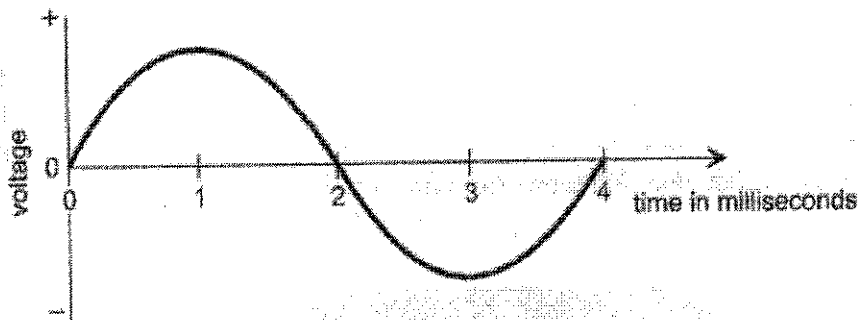
1. You are allowed **10 minutes** extra **reading time** during which you are **NOT** to write.
2. Begin each SECTION on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in 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****(15 MARKS)**

In each question there is only one correct answer. Write the identifying letter of the correct answer in your answer booklet. *(Each question is worth 1 mark)*

1. If one 3 ohm and one 6 ohm resistor are connected in parallel, the total resistance will equal to:
  - a) 1 ohm
  - b) 2 ohms
  - c) 3 ohms
  - d) 4 ohms
  
2. Coulombs/second is equivalent to
  - a) Volts
  - b) Joules
  - c) Amperes
  - d) Watt
  
3. The capacitor whose dielectric consists of one or more layers of paper like the cigarette paper:
  - a) Mica capacitors
  - b) Air insulated and vacuum capacitors
  - c) Plastic film capacitors
  - d) Paper-insulated capacitors
  
4. Which band in a four band resistor do you find the tolerance band?
  - a) 1<sup>st</sup>
  - b) 2<sup>nd</sup>
  - c) 3<sup>rd</sup>
  - d) 4<sup>th</sup>
  
5. The two types of secondary cells are:
  - a) Lead acid and car battery
  - b) Carbon zinc and mercury cell
  - c) Lead acid and Alkaline cell
  - d) Lithium cell and silver oxide cell
  
6. Which of the following will increase the resistance of a conductor?
  - a) Decreasing the length of conductor
  - b) Increasing the cross-sectional area
  - c) Decreasing the cross-sectional area
  - d) Using a thicker wire

7. If an electric current passes through a coil of (insulated) wire, it will be found that this coil shows all the characteristics if a:
- Solenoid
  - Motor
  - Magnet
  - Specific heat capacity
8. 1 kWh is equivalent to:
- 1000 kJ
  - 3.6MJ
  - 1000MJ
  - 360MJ
9. One of the three types of thermostats is the:
- Bimetallic strip type
  - Positive temperature coefficient
  - Temperature controlled type
  - Negative temperature coefficient
10. Which of the following colour codes describes a resistance of  $1.2\Omega \pm 2\%$ ?
- brown, red, yellow, gold
  - brown, black, black, silver
  - yellow, violet, gold, gold
  - brown, red, black, brown, red
11. The form factor of a sinusoidal waveform is:
- 1.11
  - 1.414
  - 0.707
  - 0.637
12. The frequency of the waveform shown below is:



- 0.25 Hz
- 250 Hz
- 2 Hz
- 4 Hz

13. The unit for the capacity of a battery is:
- a) Wh
  - b) Ah
  - c) Vh
  - d) lh
14. What is the typical end-point voltage of a carbon -zinc cell, an alkaline dry cell and silver – oxide cell is around?
- a) 1.1V
  - b) 1.3V
  - c) 1.5V
  - d) 2.1V
15. Car battery electrolyte is a mixture of water and:
- a) Lead peroxide
  - b) Sulfuric acid.
  - c) Lead sulfate
  - d) All of the above

**SECTION B** **FILL IN THE BLANKS** **(10 MARKS)**

Write the correct answer only in the answer sheet. Do not write the whole question.  
(Each question is worth 1 mark)

1. \_\_\_\_\_ can be generated by passing conductors through a magnetic field by a method called induction.
2. \_\_\_\_\_ is that property of a material which opposes the flow of electrons.
3. \_\_\_\_\_ is the property of a circuit that enables an e.m.f. to be induced in it.
4. An electromagnetic generator converts \_\_\_\_\_ energy in electrical energy.
5. The \_\_\_\_\_ of a magnetic material indicates the ease with which magnetic induction can occur in a material.
6. A \_\_\_\_\_ is the unit of the capacitor which stores a charge of one coulomb at a potential difference of one volt.

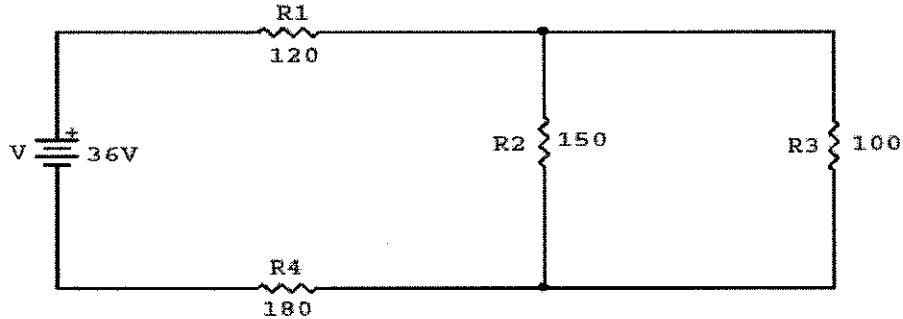
7. A cell is a device in which chemical energy is converted to electrical energy. This process is called \_\_\_\_\_ action.
8. In a \_\_\_\_\_ connected circuit there is more than one path for the current to flow between the higher and lower potential terminals.
9. In resistor colour coding the first band indicates the first significant figure, the second band the second significant figure, the third band the multiplier and the fourth band the \_\_\_\_\_.
10. The two main means of evaluating the performance of a thermostat are sensitivity and \_\_\_\_\_.

**SECTION C                      SHORT ANSWER QUESTIONS                      (20 MARKS)**

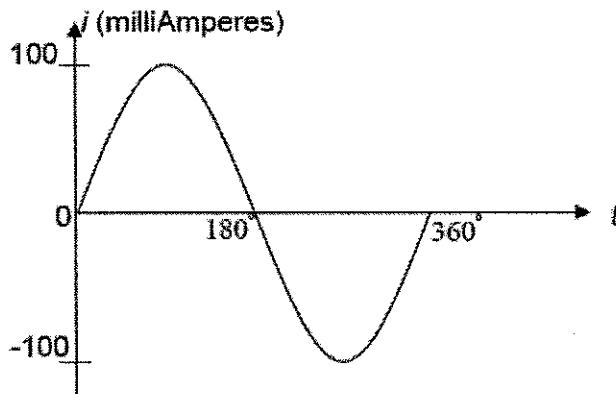
1. What is the main difference between primary and a secondary cell?                      (2 MARKS)
2. What are the three things that determine the value of capacitor?                      (3 MARKS)
3. Define the term permeability?                      (2 MARKS)
4. List the four (4) factors that determine the value of the voltage induced in a conductor.                      (2 MARKS)
5. What is the significance of RMS value of a sine wave voltage or current?                      (2 MARKS)
6. Define Ohm's Law.                      (2 MARKS)
7. List three factors that affect the resistance of a conductor.                      (2 MARKS)
8. Why cells are connected in parallel and what will happen to the total terminal voltage when they are connected this way.                      (2 MARKS)
9. State four factors to consider while selecting of Right Cell/ Battery.                      (2 MARKS)
10. What is a thermostat?                      (1 MARK)

**SECTION D****CALCULATION QUESTIONS****(50 MARKS)**

1. For the circuit shown below calculate:

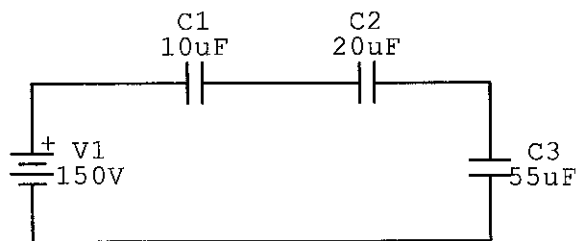


- a) Total resistance of the circuit,  $R_T$  (2 MARKS)  
b) Total current of the circuit,  $I_T$  (2 MARKS)  
c) Voltage across  $R_2$  and  $R_3$  (2 MARKS)  
d) Current through  $R_2$  and  $R_3$  (2 MARKS)
2. Calculate the value of the following capacitance using codes to the unit as stated in the brackets.
- a) 104L [nF] (1 MARK)  
b) 224K [ $\mu$ F] (1 MARK)
3. What value of current can a 6Ah battery supply for 10 hours, if this rating is for a C/10 discharge current? (2 MARKS)
4. For the following sine wave shown below calculate:

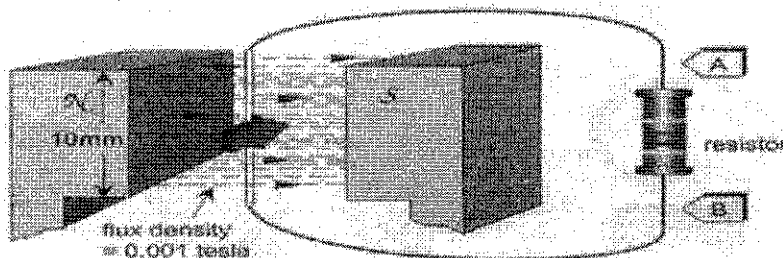


- a) Peak-to-peak current (2 MARKS)  
b) Instantaneous values at  $75^\circ$  (2 MARKS)  
c) Average value of current (2 MARKS)  
d) RMS value of current (2 MARKS)

5. 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)
6. Find the resistance of a copper cable that is 95m in length and has a diameter of  $2.5\text{mm}^2$ . The resistivity of copper is  $1.68 \times 10^{-8}\Omega\text{m}$ . (3 MARKS)
7. 100W electric light bulb is connected to a 240V supply. Determine:
- The current flowing in the bulb (2 MARKS)
  - The resistance of the bulb. (2 MARKS)
  - How much power in kWh does the light bulb uses in a month, assuming it is used for 6 hours a day and there are thirty days in a month? (2 MARKS)
  - If the tariff is 33 cents per unit, calculate the electricity bill for the month with a VAT of 9%. (2 MARKS)
8. For the capacitive circuit shown below calculate:



- Effective capacitance (2 MARKS)
  - Voltage across each capacitor (3 MARKS)
9. A magnetic flux has a cross-sectional area of  $100\text{mm}^2$  and has 50 lines of force. Calculate the flux density in the circuit. (2 MARKS)
10. The conductor in Figure below is moving at 10 metres per second through a magnetic field with a flux density of 0.001 Tesla. Calculate :

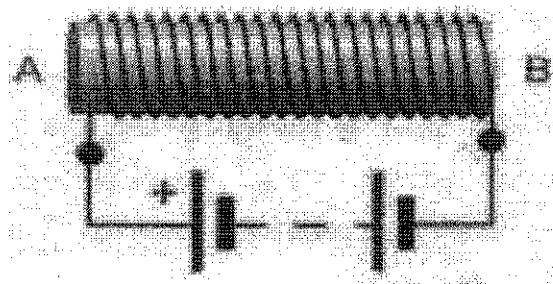


- What's the value of the induced voltage? (2 MARKS)
- What's the polarity of the voltage across the resistor? (1 MARK)

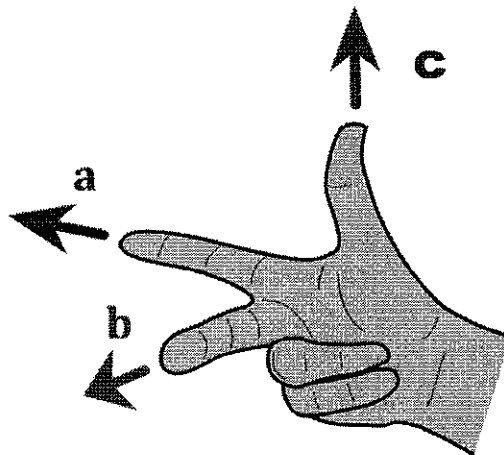
11. A cell has an internal resistance of  $1\Omega$  and an open-circuit terminal voltage of  $1.5V$ .
- Draw the circuit showing the internal voltage ( $E$ ), internal resistance ( $R_i$ ) and load. (3 MARKS)
  - What is its terminal voltage when the load current is  $0.25A$ ? (2 MARKS)

**SECTION E APPLICATION OF RULES (5 MARKS)**

1. What is the name of the component and which end of the figure shown below is the North Pole? (2 MARKS)



2. Using the Fleming's Right-Hand Rule, for figure shown below state what the letters represent. (3 MARKS)



**THE END**