



COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

CERTIFICATE III IN ELECTRONIC ENGINEERING

CERTIFICATE IV IN ELECTRONIC ENGINEERING

EEC302 – ELECTRICAL PRINCIPLES I

FINAL EXAMINATION – QUARTER 1, 2019

DATE: As per timetable

TIME: As per timetable

TIME ALLOWED: 2 HOURS 10 MINUTES

INSTRUCTIONS TO STUDENTS

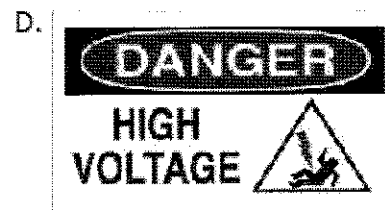
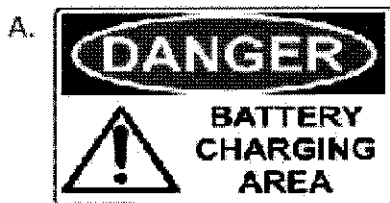
1. *You are allowed 10 minutes extra reading time during which you are NOT to write.*
2. *Begin each section on a new page and use both sides of the sheet.*
3. *Write your candidate-number at the top of each attached sheet.*
4. *Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with string.*
5. *For all sheets of paper on which rough/draft work has been done, cross each one 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. *Show all working clearly where necessary.*
8. *Programmable calculators are not allowed, especially the ones that does the conversions of number systems.*
9. *Always check your work before leaving the exam hall.*
10. **ANSWER ALL QUESTIONS.**

Section A – Multiple Choice

[20 marks]

Choose the appropriate answer from each question by writing the alphabet beside the question number in your answer booklet.

1. The symbol for the prefix 'micro' is;
A. M
B. m
C. n
D. μ
2. Choose the correct statement which defines a capacitor?
A. Four terminal device used as switch.
B. A device that stops the flow of current.
C. Two terminal device used for storing charge.
D. Two terminal device used to vary the current in the circuit.
3. What is the tolerance value of a 4-band resistor having a fourth band as color brown?
A. $\pm 1\%$
B. $\pm 2\%$
C. $\pm 5\%$
D. $\pm 10\%$
4. Which of the following is NOT an electrical safety hazard sign?



5. Which of the following has a negative charge?
A. Neutron
B. Electron
C. Proton
D. molecule
6. Henry is the unit for?
A. Capacitance
B. Magnetic Flux
C. Conductance
D. Inductance

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7. Which of the following is a Personal Protection Equipment (PPE)?
- A. Bracelet
 - B. Helmet
 - C. Cap
 - D. Watch
8. The smallest particle of any element that still retains the characteristics of that element is known as;
- A. Atom
 - B. Element
 - C. Molecule
 - D. Nucleus
9. Charge of an electron is equal to;
- A. 1.602×10^{-16} C
 - B. 1.602×10^{-17} C
 - C. 1.602×10^{-18} C
 - D. 1.602×10^{-19} C
10. What is the capacitance of a ceramic capacitor with 103 stamped on it?
- A. 103pF
 - B. 10nF
 - C. 1pF
 - D. 10pF
11. Which of the following determines the capacitance of a capacitor?
- A. Plate area, thickness, and Temperature coefficient
 - B. voltage rating, dielectric constant, and temperature coefficient
 - C. Plate area, voltage rating, and plate separation
 - D. Plate area, Type of dielectric between plates, and plate separation
12. In an atom, which of the following orbits around a nucleus?
- A. Neutron
 - B. Electron
 - C. Proton
 - D. Molecule
13. Which of the following electric charges will attract each other?
- A. North and South
 - B. North and North
 - C. Positive and Positive
 - D. Positive and Negative
14. What are the two major categories for capacitors?
- A. fixed and variable
 - B. commercial and industrial
 - C. polarized and non-polarized
 - D. low and high power value

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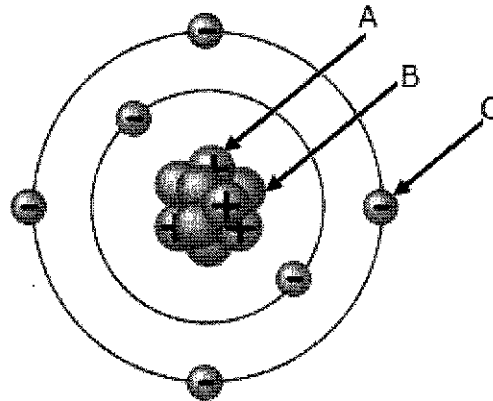
15. An electric heater connected to the 240V mains draws a current of 1.2A. What is the resistance of the heater?
- A. 200Ω
 - B. 288Ω
 - C. $200k\Omega$
 - D. $288k\Omega$
16. A capacitance meter read 0.00062 Farads while measuring a capacitor value. What is the value in micro farads?
- A. $0.62\mu\text{F}$
 - B. $6.2\mu\text{F}$
 - C. $62\mu\text{F}$
 - D. $620\mu\text{F}$
17. A 32V lamp draws a current of 2A. What is the power consumed by the lamp?
- A. 16W
 - B. 64W
 - C. 512W
 - D. 2048W
18. Material that obeys Ohm's Law is called
- A. Linear conductor
 - B. Potential difference
 - C. Copper
 - D. Insulator
19. In an experiment, several wires of the same length, L , and metal with different cross-sectional areas, A , were chosen. For each wire, the resistance, R , and the cross-sectional area, A , were measured. The relationship between R and A can be stated that
- A. R is independent of A
 - B. R is directly proportional to A
 - C. R is inversely proportional to A
 - D. there is a logarithmic relationship between R and A
20. You are first on scene and the victim is unresponsive and with no pulse. What is the best approach you will take?
- A. Perform CPR
 - B. Do not initiate resuscitation
 - C. Give the victim any medication
 - D. Leave the victim alone and get help

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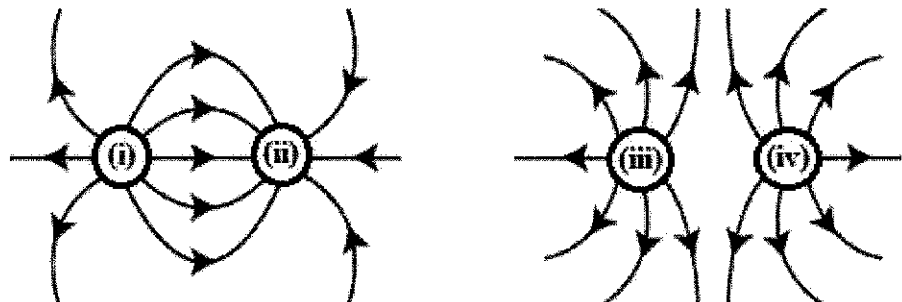
Section B – Short Answer Questions

(30 marks)

1. If the resistance of a circuit is increased three times more, what happens to the current in the circuit? Explain. (3 marks)
2. Basic model of an atom is shown below. Identify the marked components labeled A, B and C. (3 marks)



3. Figure below shows the electric field lines around two pair of charges. Indicate the polarity of the charges labelled (i), (ii), (iii) & (iv). (4 marks)



(A). (B). (4 marks)

4. State the safety precautions you would take to remove a victim who has been electrocuted and is still in contact with the live 240V AC line. (2 marks)
5. List the four factors that affect the resistance of a conductor. (4 marks)
6. What are the three things that the voltage induced in a coil depends on? (3 marks)
7. Draw the magnetic field lines for the two magnet arrangement as shown below. Will the magnets attract or repel? (5 marks)



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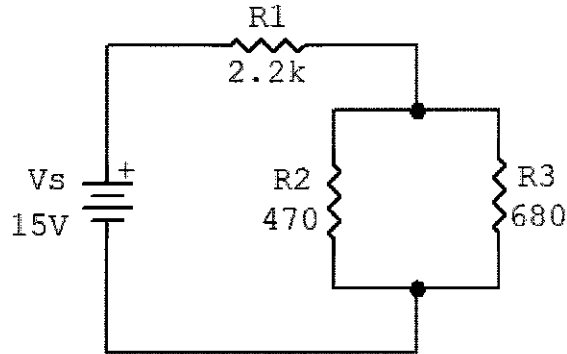
8. Define the term magnetomotive force? (2 marks)
9. State Kirchhoff's Voltage Law. (2 marks)
10. What is Ohms Law. (2 mark)

Section C – Calculations

(50 marks)

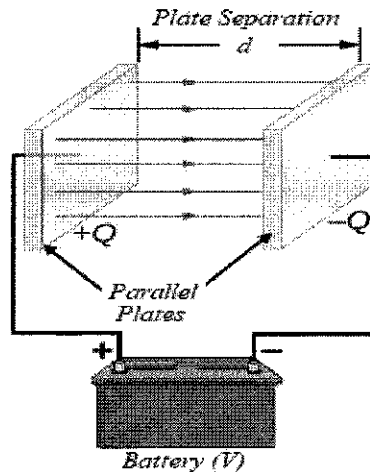
Show all working clearly in your answer booklet.

1. For the circuit given below,



Calculate the;

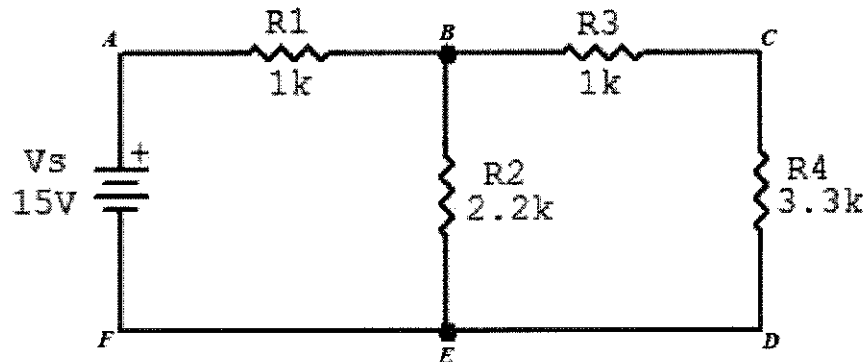
- A. Total resistance (R_T) of the circuit, (2 marks)
 - B. Total current (I_T) of the circuit, (2 marks)
 - C. Current through resistors R_2 and R_3 , (4 marks)
 - D. Voltage across each resistor. (3 marks)
2. A ceramic capacitor has effective plate dimensions of 4cm x 4cm and is separated by 0.2mm of ceramic of relative permittivity (ϵ_r) 100.



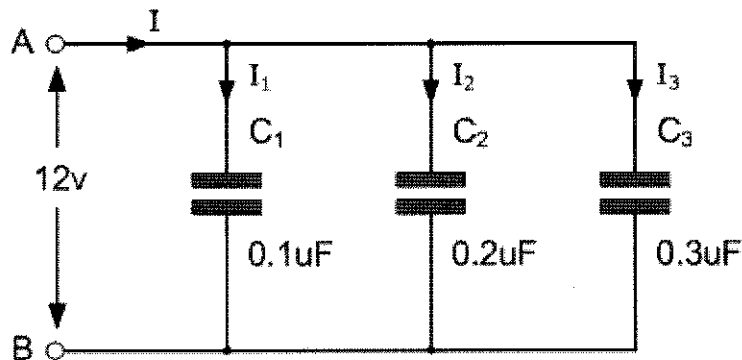
- A. Calculate the capacitance of the capacitor. (3 marks)
[Hint: $\epsilon_0 = 8.85 \times 10^{-12} F/m$]
- B. If the capacitor in part (A) is connected to a battery of 12V, what will be the amount of charge flow in the circuit? (2 marks)

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3. Find the force that should be exerted on a 6m length of a conductor, carrying a current of 600mA situated at right angles in a magnetic field with a flux of 5 Tesla. (2 marks)
4. A particular 4-band resistor has its manufacturers specified resistance range of 646Ω to 714Ω . Calculate the following;
 - A. Resistance of the resistor (2 marks)
 - B. Tolerance in percentage (2 marks)
 - C. Colour code of the resistor (2 marks)
5. Determine the following for the circuit given below;



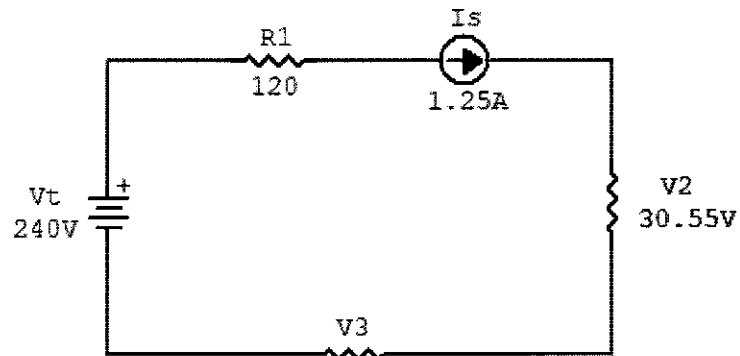
- A. KCL equation at Node B. (1 mark)
 - B. KVL equations for loops ABEFA, BCDEB and ACDF A in clockwise direction. (3 marks)
6. For the capacitor circuit show below,



- Calculate;
- A. The total capacitance of the circuit (2 marks)
 - B. Total charge of the circuit (2 marks)
 - C. Voltage across each capacitor (3 marks)
 - D. Charge through each capacitor (6 marks)
7. Calculate the resistance of a 100m copper wire having a thickness of 3mm. ($\rho_{Cu} = 1.68 \times 10^{-8} \Omega m$) (3 marks)

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8. Determine the unknown voltage, V_3 , for the circuit shown below using Kirchhoff's Voltage Law. (You are to write the KVL equation for the loop and solve).



(3 marks)

9. Two inductors, whose self-inductances are given as 56mH and 82mH respectively, are positioned next to each other on a common magnetic core so that 80% of the lines of flux from the first coil are cutting the second coil. Calculate the total mutual inductance that exists between them.

[Hint: $M = k\sqrt{L_1L_2}$]

(3 marks)

The End

-----GOOD LUCK-----