CRAWFORD UNIVERSITY

FAITH CITY, IGBESA, OGUN STATE

COLLEGE OF NATURAL AND APPLIED SCIENCES

- B.Sc. EXAMINATION HARMATTAN SEMESSTER 2022/2023 SESSION

ICT 413: CIRCUIT ANALYSIS AND THEORY

TIME ALLOWED 2½ **HOURS**

INSTRUCTIONS: **ANSWER 4 QUESTIONS ONLY**

1. (a) With a suitable diagram, explain what you understand by the following terms with respect to a voltage source: (7 marks)
i. emf
ii. Terminal voltage
iii. Internal resistance
State the unit of measurement in each case above.

(b) The terminal voltage of a car battery is found to be 12.8V when supplying a 40W load. The voltage drops to 12.0 volts when supplying a 72Watts load.

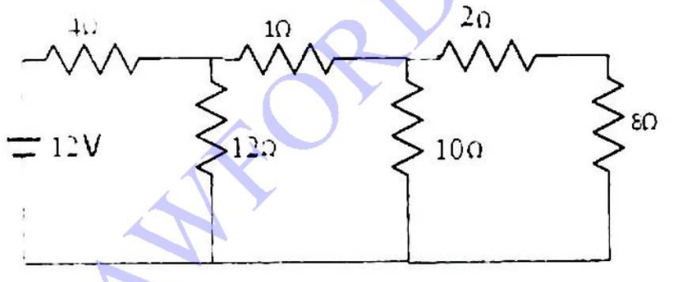
i. Draw the circuit diagram and indicate clearly the emf of the battery, the terminal voltage, the internal resistance and the load resistance. (4 mks)

ii. Calculate the battery emf and the internal resistance. (4 mks)

2. (a) Write short notes on the following, making sure to mention the unit of measurement in each case (9 MKS):
i. voltage ii. Electric current iii. Electric power iv. Resistance
v. Charge vi. Electrical energy
(b) A certain device rated 240V, 40 Watts is connected to a 240V outlet. Calculate: (6mks)

i. The current flowing through the device
ii. The resistance of the device as a load
iii. The energy consumed by the deice after 1 hour of use

3 (a) what is a node? (1 MK)

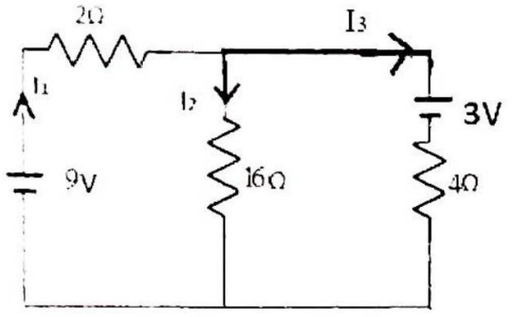


(b) Copy the circuit diagram above and label all the nodes with capital letters A, B, C etc. (2 mks)
(c) Using series of diagrams, find the equivalent resistance of the circuit above. (8 mks)
(d) State Ohm's Law. Use this law with your answer in (c) above to calculate the current and the voltage across the 4Ω resistor. (4 mks)

4 (a) State Kirchhoff's Voltage Law. (2 mks)

(b) In the circuit shown below determine the magnitude and direction of each of the currents I_1, I_2, I_3. (11 mks)

(c) From your answer in (b), calculate the voltage across the 16Ω resistor. (2 mks)



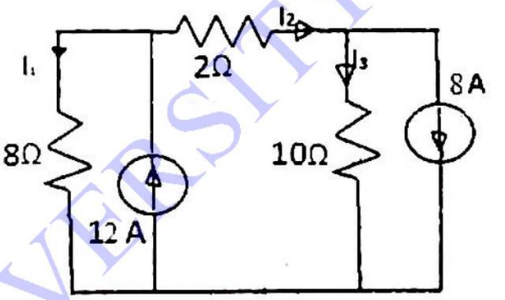
5 (a)State Kirchhoff's Current Law. (2 mks)

(b) What is a current source? (1 mk)

With suitable diagrams explain the difference between an ideal current source and a practical current source. (4 mks)

(c) The figure below is the equivalent circuit of a certain amplifier.

ii. Find the magnitude and direction of each of the currents I_1, $I_2$and I_3. (6 mks)



iii. Calculate the voltage across the 2Ω resistor. (2 mks)

6 (a) A certain voltage divider circuit consists of two resistors R_1 and R_2. Using a suitable diagram, derive the formula for calculating the voltageV_1 across R_1 in terms of the supply voltage V, and the resistances R_1 and R_2 (3 mks)

(b) The output of laptop charger is 13V. A voltage divider containing a LED and resistor R_1 is connected across the output to indicate that the charger is working. Use the formula derived in (a) above to calculate the resistance R_1 correct to 3 significant figures. Take V =13 volts, V_2 = 2.6 volts, R_2 = 100Ω. (3 mks)

(c)With a suitable diagram explain the following waveforms taking care to show the differences between one and the other. For each waveform, mention one area it is used or encountered in the practice of ICT. (8 mks)

i. sinusoidal wave
ii. impulse
iii. Square wave
iv. Pulse

(d). What does duty cycle mean? (1 mk)