

CRAWFORD UNIVERSITY

FAITH CITY, IGBESA, OGUN STATE

COLLEGE OF NATURAL AND APPLIED SCIENCES

B.Sc. EXAMINATION HARMATTAN SEMESSTER 2021/2022 SESSION

ICT 413: CIRCUIT ANALYSIS AND THEORY

TIME ALLOWED: 2½ HOURS

INSTRUCTIONS: ANSWER 4 QUESTIONS ONLY

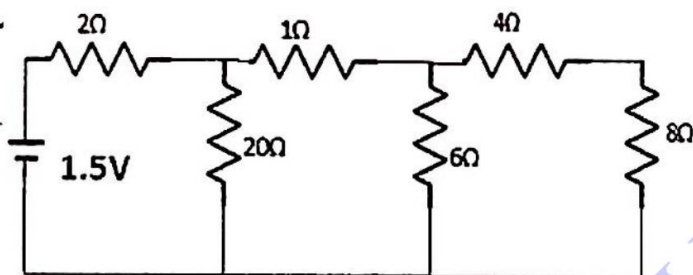
1. (a) Write short notes on the following, making sure to mention the unit of measurement in each case: (9 mks)

- i. voltage ii. Electric current iii. Electric power iv. Resistance
v. Capacitive Reactance vi. Inductive Reactance

(b) A certain device rated 220V, 55 Watts is connected to a 220V 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 2 hours of use

2 (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 2Ω resistor. (4 mks)

3 (a) Draw the waveform of an A.C. voltage (1 mk). In the waveform, indicate a cycle, a time period and the amplitude. (3 marks)

(b) If the time period and the amplitude in (a) are 20mS and 320V respectively, calculate the frequency and the RMS value. (2 mks)

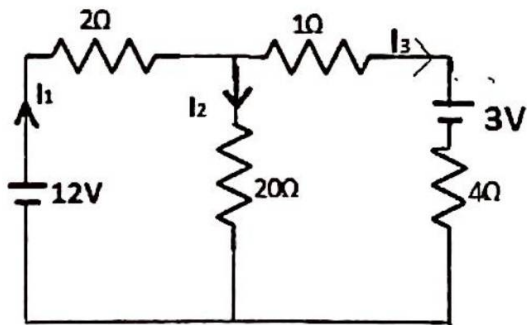
(c) A fan in form of a coil with a load resistance of 70Ω and inductance of 0.42H is connected in series with a capacitor of 350μF across a power supply of 220 volt, 50Hz and 2Ω internal resistance.

- i. Draw the circuit diagram showing the devices with all the stated parameters. (3 marks)
ii. Calculate the inductive reactance, capacitive reactance, total impedance and the current flowing. (6 marks)

4(a) State Kirchoff'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 marks)

(c) From your answer in (b), calculate the voltage across the 20Ω resistor.



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

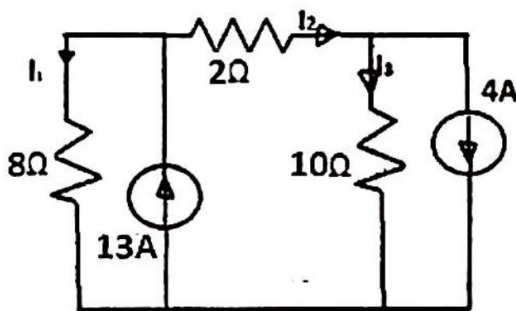
(b) What is a current source? (1 mark)

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

(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 marks)

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



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 voltage V_1 across R_1 in terms of the supply voltage V , and the resistances R_1 and R_2 (3 marks)

(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, $R_2 = 100\Omega$. (3 marks)

(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 marks)

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

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