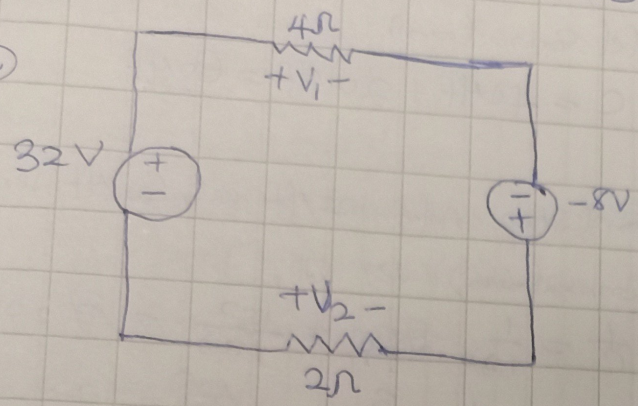
NELSON E NDU

(11)



Solution

Using ohms law

Rtotal = R1 + R2

= 4 + 2 = 6Ω

Total Voltage = 32 - 8 = 24V

V = IR => 24 = 6 x I

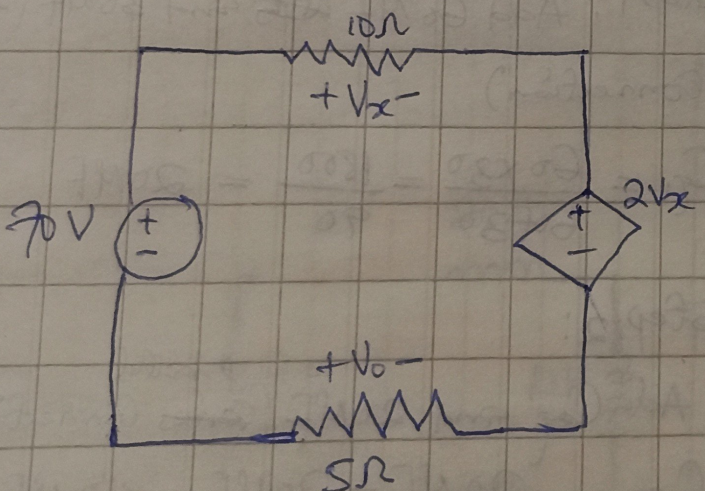
24 = 6I => I = 24/6

I = 4A

V1 = IR => 4 x 4 = 16V

V2 = 4 x 2 = 8V

2,



Solution

Voltage across 10Ω Vx = 10I

Voltage across 5Ω Vo = 5I

Then applying Kirchhoff's voltage law KVL

Sum of voltage rise or drop around the loop equal to 0

∴ 70 - Vx - 2Vx - Vo = 0

70 - 3Vx - Vo = 0

70 - 3(10I) - 5I = 0

70 - 30I - 5I = 0

70 - 35I = 0

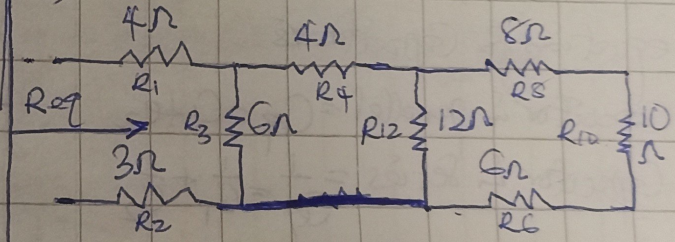
70 = 35I I = 70/35 = 2A

Finding Vx and Vo

Vx = 10I = 10 x 2 = 20V

Vo = 5I = 5 x 2 = 10V

3,



Solution

Finding the equivalent resistance Req between the two left terminal.

Add 3 resistor in series at right

R = R8 + R10 + R6 = 8 + 10 + 6 = 24Ω

Step 2: Combine 24Ω with 12Ω (resistors in parallel)

$R = \frac{R_{24} \times R_{12}}{R_{24} + R_{12}} = \frac{24 \times 12}{24 + 12} = \frac{288}{36} = 8\Omega$

step 3: Add 4Ω with 8Ω (resistors in Series)

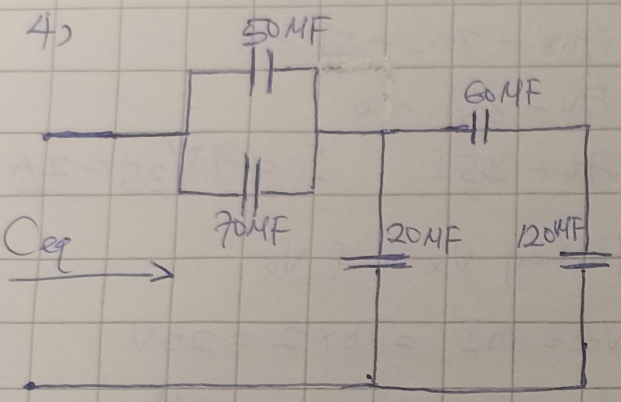
$R = R_4 + R_8 = 4\Omega + 8\Omega = 12\Omega$

Step 4; Combine 12Ω with 6Ω (||)

$R = \frac{12 \times 6}{12+6} = \frac{72}{18} = \underline{4\Omega}$

Final step: $R_{eq} = 4\Omega + 4\Omega + 3\Omega = \underline{\underline{11\Omega}}$

4)



~~equal~~ Solution

equation for Capacitors

Capacitor in parallel = $C_{eq} = C_1 + C_2$

Capacitor in Series = $\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$

Step 1: Combine 50MF with 70MF (parallel Capacitors)

$C = 50 + 70 = 120MF$

Step 2: Add 60MF and 120MF (Series Connection)

$\frac{1}{C} = \frac{1}{60} + \frac{1}{120} = \frac{2+1}{120} = \frac{3}{120}$

$3C = 120 \quad C = \frac{120}{3} = \underline{\underline{40MF}}$

Step 3: Combine 40MF with 20MF (parallel Connections)

$C = 40MF + 20MF = \underline{60MF}$

final step: Add 120MF with 60MF (Series Connection)

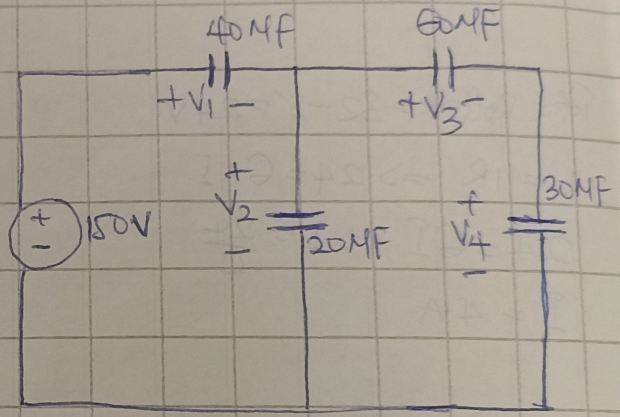
$\frac{1}{C} = \frac{1}{120} + \frac{1}{60} = \frac{1+2}{120} = \frac{3}{120}$

$\frac{1}{C} = \frac{3}{120} \Rightarrow 3C = 120$

$C = \frac{120}{3} = 40MF$

$C_{eq} = 40MF$

5)



finding voltage across each of the Capacitance

Solution:

Step 1: Add 60MF ~~with~~ and 30MF (Series Connection)

$C_{eq1} = \frac{60 \times 30}{60+30} = \frac{1800}{90} = 20MF$

Step 2:

Add C_{eq} and 20MF (parallel Connections)

$C_{eq2} = 20MF + 20MF = 40MF$

step 3:

combine C_{eq2} with 40MF (Series Connect

$C_{total} = \frac{40 \times 40}{40+40} = 20\,MF$

Step 4: finding V_1 and V_2

Since top Capacitor (40MF) is equal to C_{eq2} (40MF), the 150 V source split into two equal parts

$\therefore \frac{150V}{2} = 75V$

$V_1 = 75 \quad V_2 = 75V$

Step 5: Finding V_3 and V_4 using voltage divider

$V_3(60MF) = V_{total} \times \frac{C}{C_3 + C_4}$

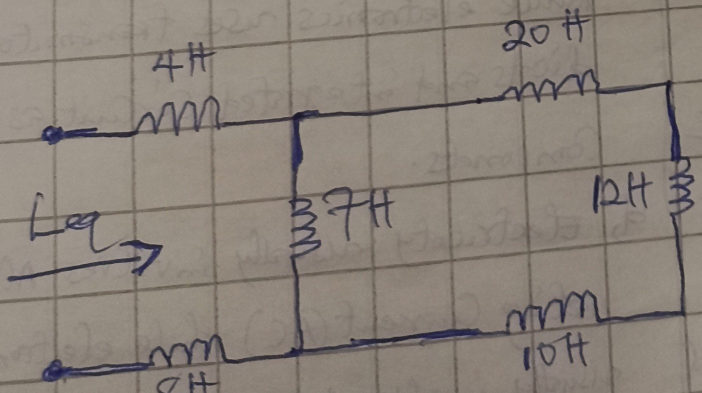
$= 75 \times \left(\frac{30}{60+30}\right) = 75 \times \frac{1}{3}$

$= 25V$

$V_4(30MF) = \frac{C}{C_3+C_4} = 75 \times \frac{60}{60+30}$

$= 75 \times \frac{2}{3} = 50V$

6,



Solution

Step 1: Add the 20H, 12H and 10H (Series Connection)

Inductance equation

$L_{eq} = L_1 + L_2 + L_3 \ldots + L_n$ (in series)

$\frac{1}{L_{eq}} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} \ldots + \frac{1}{L_n}$ (in parallel)

$L_{eq} = \frac{L_1 \times L_2}{L_1 + L_2}$ (two inductors in parallel)

$\therefore L_{right} = 20H + 12H + 10H$(

$\therefore L_{right} = 20H + 12H + 10H = 42H$ (Series connection)

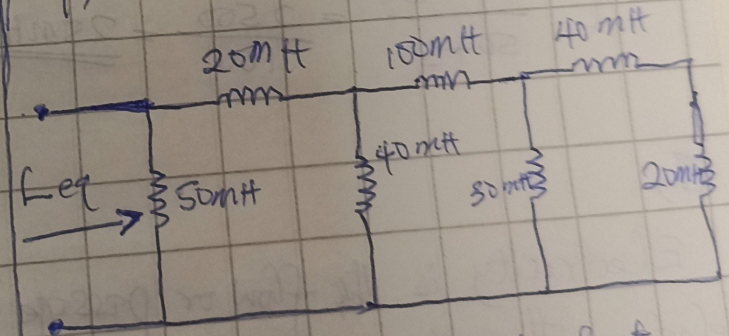
Step 2: Combine 42H with 7H (Parallel connection)

$L_{parallel} = \frac{42 \times 7}{42+7} = \frac{294}{49} = 6H$

Final Step: Add 4H, 6H, and 8H (Series connection)

$L_{eq} = 4H + 6H + 8H = 18H$

7,



Finding Inductance equivalent

Solution, Step 1

Add 40mH and 20 mH (Series Connection)

$L_{right} = 40mH + 20mH = 60mH$

step 2: Combine 60mH and 30mH (parallel Connection)

$L_{parallel} = \frac{60 \times 30}{60+30} = \frac{1800}{90} = 20mH$

step 3: Add 100mH and 20mH (Series Connection)

$L_{right} = 100mH + 20mH = 120mH$

step 4: Combine 120mH and 40mH (parallel Connection)

$L_{parallel} = \frac{120 \times 40}{120+40} = \frac{4800}{160} = 30mH$

step 5: Add 30mH and 20mH (Series Connection)

$L_{right} = 30mH + 20mH = 50mH$

final step: Combine 50mH and vertical 50mH to get L_{eq} (parallel Connection)

$\therefore L_{eq} = \frac{50 \times 50}{50+50} = \frac{2500}{100} = 25mH$

8,

Electricity is the flow or passage of electron through a Conductor such as Copper wire to transmit electrical power. Its aims of Converting electrical energy into other forms of energy such as Light, heat, Mechanical motion etc while Electronic involves Controlling the flow of electrons to perform a specific tasks such as amplifying signals, processing data or switching. It uses transistors and microchips as its components to manipulate electrical Current. eg Smartphone, Computer, microphone.

Different between electric Current and electronics:

a, Electricity transmits power while electronics transmit information.

b, Electricity uses Conductor as medium for transmission while electronics uses Semi-Conductors.

c, Electricity uses Resistors, Capacitors and inductors as its Components while electronics uses transistors, diods and integrated Circuit as its Components.

d, Electricity usually involves Alternating Current (AC) while electronics usually involves Direct Current (DC)

e, Electricity is typically high voltage level while electronic is typically low voltage level.

9, ~~Using Smart Thermostat to explain how electronics Contribute~~

to Explanation of how electronics Contribute to the funct ionality of Smart Thermostat. Smart thermostat function as an intelligent System where electronics bridge the gap between physical data and electrical power. Thermistors first Sense the envir onmental changes by translating temperature into variable resist ance. This data is processed by a microcontroller, the System's brain which uses programmed logic to decide when to activate the HVAC system. To protect this sensitive processor, Capacitors filter the power supply to ensure a ~~Smoth~~ Smooth, noise free voltage. When activation is required, the microcontroller triggers transistors to act as electronic switches, safely engaging high power Connections to the AC. Simultaneously, inductors in the Wi-fi modules forms radio frequencies to enable wireless Communication with internet.

~~10~~ 10,

Scope of electricity and electronics with their Applications

Electricity involves the generation, distribution and utili zation of electrical power to perform physical work. it primarily deals with high voltage systems and the Conversion of energy into light, heat etc. Applications include power grid, industrial motors, Heating and lighting, Renewable energy etc.

Electronics involves the precise manipulation of low voltage Currents to process, store, and transmit information: it relies on semi-Conductor materials and active Components such as transistors to Create logical decision within a Circuit. Applications are: Computing and IT, Telecommunications, IoT and Smart devices, Medical electronics etc.