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Analog Electronics - I
Assignment - 1.1.

Qn.1

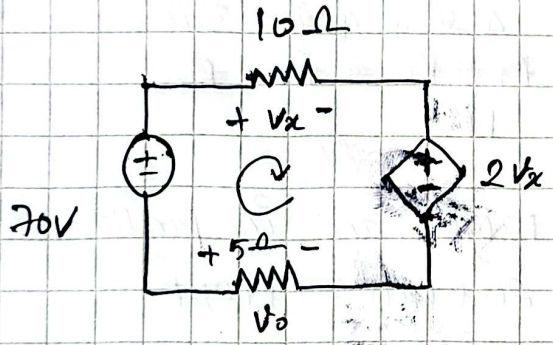
Applying KVL,

$$32 - 4I - (-8) - 2I = 0$$
$$32 - 4I + 8 - 2I = 0$$
$$40 - 6I = 0$$
$$6I = 40$$
$$I = \frac{40}{6} = 6.67A$$

$$V_1 = 4I = 4\Omega * 6.67A$$
$$= 26.67V$$

$$V_2 = -2\Omega * I = -2\Omega * 6.67A$$
$$= 13.33V \#$$

Qn. 2.




$V_x = 10\Omega * I = 10I$

$V_o = -5I$

Using KVL,

$$-70 + V_x + 2V_x + V_o = 0$$
$$-70 + 10I + 2(10I) + 5I = 0$$
$$-70 + 35I = 0$$
$$35I = 70$$
$$I = 2A$$

$V_x = 20V$

$V_o = -10I$ #

Qn. 3. 8 Ω, 10 Ω, 6 Ω are in series

$R_1 = 8 + 10 + 6 = 24\ \Omega$

$R_1$ is parallel with 12 Ω resistor

$$R_2 = \frac{(24 \times 12)}{(24 + 12)} = 8\ \Omega$$

$R_2$ is series with 4 Ω

$R_3 = (8 + 4)\ \Omega = 12\ \Omega$ resistor

$R_3$ is parallel with 6 Ω resistor

$$R_4 = \left(\frac{12 \times 6}{12 + 6}\right) = 4\ \Omega$$

So, $R_{eq.} = 4\ \Omega + 4\ \Omega + 3\ \Omega$

$= 11\ \Omega$ //

Qn. 4. ⇒ Here, 20 μf & 120 μf are in parallel.

$C_1 = 20 + 120 = 140\ \mu f$

60 μf capacitor is in series with 140 μf

i.e. $C_2 \Rightarrow \frac{60 * 140}{60 + 140} = 42\ \mu f$

50 μf & 70 μf capacitors in parallel

$C_3 = 50 + 70 = 120\ \mu f$

$C_2$ (42 μf) & $C_3$ (120 μf) are in series.

$$C_{eq.} = \frac{120 \times 42}{120 + 42} = 31.11\ \mu f.$$

Qn. 5.

$$V_1 = V_{total} \times \frac{C_{bottom}}{C_{top} + C_{bottom}} = 150 \times \frac{20}{40+20}$$

$$V_1 = 50\,V$$

$$V_2 = V_{total} \times \frac{C_{top}}{C_{top} + C_{bottom}} = 150 \times \frac{40}{40+20} = 100\,V$$

$$V_3 = 150 \times \frac{30}{60+30} = 50\,V$$

$$V_4 = 150 \times \frac{60}{60+30} = 100\,V$$

Qn. 6.

$\Rightarrow$ Series, 20H, 12H & 10H $\Rightarrow$ 42H

42H & 7H in parallel, $\Rightarrow \frac{7 \times 42H}{7+42} = 6H$

Now, 6H is in series with (4H & 8H)

$$L_{eq.} = 4 + 6 + 8 = 18\,H \;\#$$

Qn. 7. $\Rightarrow$ 40mH & 20mH are in series $\Rightarrow L_1 \Rightarrow 60mH$

$L_1$ is in parallel with 30mH, inductor,

$$L_2 \Rightarrow \frac{30 \times 60}{30+60} = 20mH$$

20mH is in series with 100mH inductor $\Rightarrow L_3 = 120mH$

120mH in parallel with 40mH, $L_4 = \frac{40 \times 120}{40+120} = 30mH$

30mH is in series with 20mH, $L_5 = 20 + 30 = 50mH$

50mH is in parallel with 50mH

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