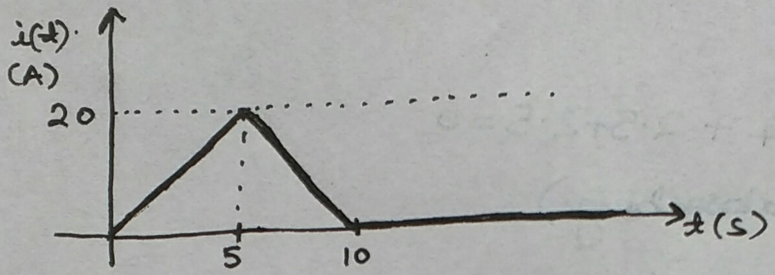
1.11) $i(t) = \begin{cases} 4t \text{ A} & 0 \le t \le 5\text{s} \\ 40-4t \text{ A} & 5 < t \le 10\text{s} \\ 0 \text{ A} & t > 10\text{s} \end{cases}$



We know that $i = \frac{dq}{dt} \Rightarrow q = \int i \, dt$.

which is infact area under the $i(t)$ vs. t curve.

$$q = \text{Area} = \frac{1}{2} \times (10-0) \times (20-0) = \frac{1}{2} \times 10 \times 20 = 100 \text{ A-s} = 100\text{C}.$$

When calculated using integral,

$$q = \int_0^5 4t \, dt + \int_5^{10} 40 - 4t \, dt + \int_{10}^{\infty} 0 \, dt$$

$$= 4 \times \frac{t^2}{2} \Big]_0^5 + \left(40t - \frac{4t^2}{2}\right) \Big]_5^{10} + 0$$

$$= 50 + 200 - 150 = 100 \text{ A-s} = 100 \text{ C}.$$

1.19) Maximum power dissipated by device $P = 0.25$ W

Voltage $V = 9$V.

$$P_{max} = V \times i_{max}.$$

$$\Rightarrow i_{max} = \frac{P_{max}}{V} = \frac{0.25}{9} \simeq 0.0278 \text{ A}$$

1.23) $P_1 = V_1 i_1 = 20\times(-2) = -40W$

$P_2 = 20W \quad P_3 = 10W \quad P_4 = ? \quad P_5 = P_6 = 2.5W$

Since sum of device powers = 0

$$\Rightarrow \sum_{i=1}^{6} P_i = 0$$

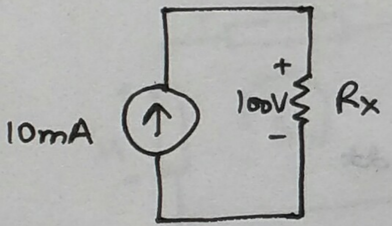
$$\Rightarrow -40+20+10+P_4+2.5+2.5=0$$

$$\Rightarrow P_4 = 5W. \text{ (absorbing)}$$

$i_4 = 1A$

$$\therefore V_4 = \frac{P_4}{i_4} = \frac{5}{1} = 5V$$

2.6)



$$R_x = \frac{100}{10\times10^{-3}} = 100\times10^2 = 10k\Omega$$

Power delivered to resistor $= Vi = 100\times10\times10^{-3}$
$= 1W$

2.7) Resistor has 3 orange stripes followed by a gold stripe.

$R = 33k\Omega \pm 5\%.$

given resistance $= 34.9\ k\Omega.$

~~tolerance~~ margin here $= \frac{34.9-33}{33}\times100 = 5.76\%$

This does not lie in tolerance limit.

Hence, the resistor is not properly coded.

correct coding: orange, yellow, orange, gold. or
3 stripes of orange & followed by silver.

2.9) $R = 100\,k\Omega$

Power rating $P = 0.125\,W$

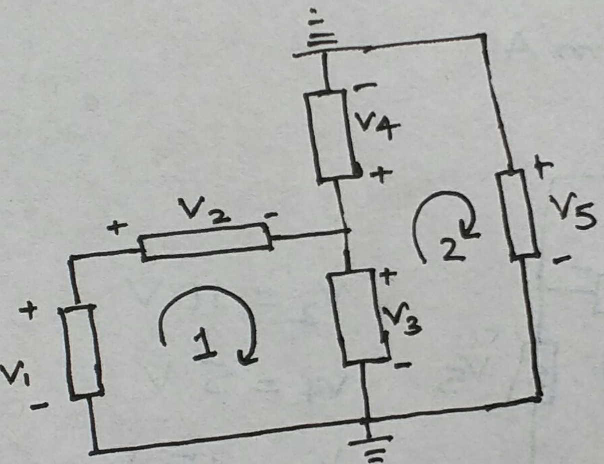
$\therefore V_{max} = ?$

$\because P = \frac{V_{max}^2}{R}$

$\Rightarrow V_{max} = \sqrt{P \times R} = \sqrt{0.125 \times 100 \times 10^3}$

$= \sqrt{125 \times 100} = 111.8\,V$

2.14) $V_1 = 3V$ $V_3 = 5V.$



KVL in 1 $\Rightarrow -V_1 + V_2 + V_3 = 0$

$\Rightarrow -3 + V_2 + 5 = 0$

$\Rightarrow V_2 = -2V$

For V_5, both terminals are connected to ground.

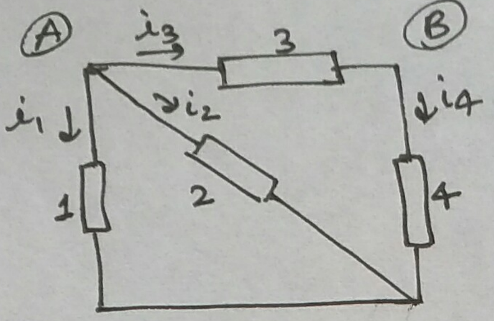
$\therefore$ voltage drop $V_5 = 0\,V.$

KVL in 2 $\Rightarrow -V_3 + V_4 + V_5 = 0$

$\Rightarrow -5 + V_4 + 0 = 0$

$\Rightarrow V_4 = 5\,V.$

2.16)



$i_2 = -20mA$

$i_4 = 10mA$

$i_1, i_3 = ?$

KCL at B $\Rightarrow i_3 - i_4 = 0$

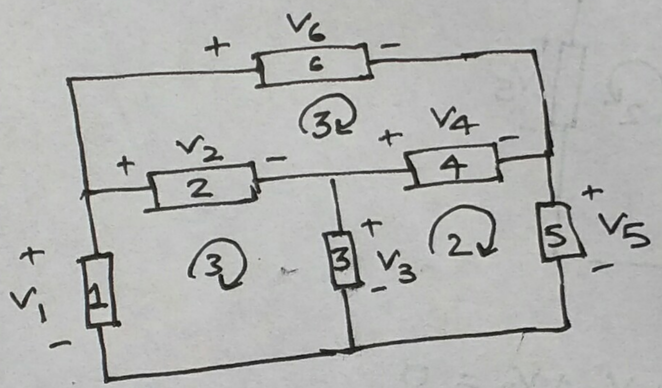
$\Rightarrow i_3 = i_4 = 10mA.$

KCL at A $\Rightarrow -i_1 - i_2 - i_3 = 0$

$\Rightarrow -i_1 + 20mA - 10mA = 0$

$\Rightarrow i_1 = 10mA$

2.21)



$V_2 = 10V$

$V_4 = 5V$

$V_5 = 15V$

KVL in 3: $-V_2 + V_6 - V_4 = 0$

$\Rightarrow -10V + V_6 - 5V = 0$

$\Rightarrow V_6 = 15V$

KVL in 2: $-V_3 + V_4 + V_5 = 0$

$\Rightarrow V_3 = V_4 + V_5 = 5 + 15 = 20V$

KVL in 1: $-V_1 + V_2 + V_3 = 0$

$\Rightarrow V_1 = V_2 + V_3 = 10 + 20 = 30V$

2.22) KCL at A: $i_1 - i_2 - i_4 + i_3 = 0 \Rightarrow i_4 = i_1 - i_2 + i_3$

$\Rightarrow i_4 = 25mA - 10mA - 15mA = 0mA$

KCL at B: $-i_1 + i_2 - i_5 = 0 \Rightarrow i_5 = -i_1 + i_2$

$= -25mA + 10mA$

$= -15mA$