

A.

$$V_a - V_b = 25 \quad \text{--- (1)}$$

$$2 + \frac{V_a - 50}{50} + \frac{V_b - 150i_s}{150} + \frac{V_b}{75} = 0$$

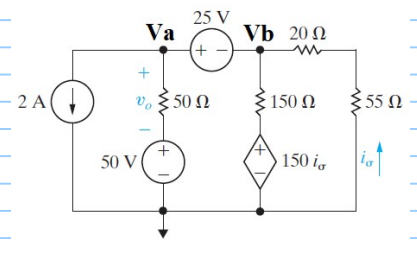
But  $i_s = \frac{-V_b}{75}$  } ↗

$$2 + \frac{V_a}{50} - 1 + \frac{V_b}{150} + \frac{V_b}{75} + \frac{V_b}{75} = 0$$

$$\left(\frac{1}{50}\right) V_a + \left(\frac{1}{30}\right) V_b = -1 \quad \text{--- (2)}$$

$$\begin{aligned} V_a &= -3.125 \text{ V} \\ V_b &= -28.125 \end{aligned}$$

$$V_o = V_a - 50 = -53.125 \text{ V}$$



B.

$$V_a - V_b = 25 \quad \text{--- (1)}$$

$$2 - 18V_{\Delta} + \frac{V_b}{150} + \frac{V_b}{75} = 0$$

$$\text{But } V_{\Delta} = \frac{20}{20+55} V_b = \frac{4}{15} V_b$$

then

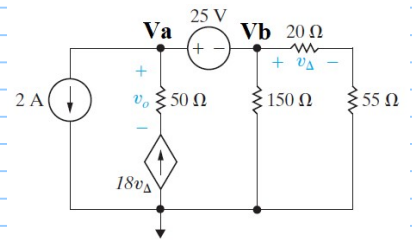
$$2 - 18 \times \frac{4}{15} V_b + \frac{V_b}{150} + \frac{V_b}{75} = 0$$

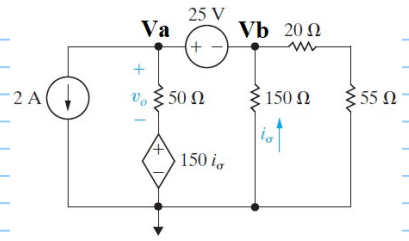
$$-\frac{239}{50} V_b = -2$$

$$V_b = 0.418 \text{ V}$$

$$\therefore V_a = 25.418 \text{ V}$$

$$V_{\Delta} = (-18V_{\Delta})(50) = \left(-18 \times \frac{4}{15} V_b\right)(50) \\ = -125.4 \text{ V}$$





c.

$$V_a - V_b = 25 \quad \text{--- (1)}$$

$$2 + \frac{V_a - 150i_\sigma}{50} + \frac{V_b}{150} + \frac{V_b}{75} = 0$$

But  $i_\sigma = -\frac{V_b}{150}$   $\uparrow$

then

$$2 + \left(\frac{1}{50}\right)V_a + \frac{V_b}{150} + \frac{V_b}{150} + \frac{V_b}{75} = 0$$

$$\left(\frac{1}{50}\right)V_a + \left(\frac{2}{75}\right)V_b = -2 \quad \text{--- (2)}$$

$$V_a = -28.57 \text{ V}$$

$$V_b = -53.57 \text{ V}$$

$$\begin{aligned} v_\sigma &= V_a - 150i_\sigma \\ &= V_a - 150\left(-\frac{V_b}{150}\right) \\ &= V_a + V_b \\ &= -82.14 \text{ V} \end{aligned}$$

D.

$$V_a = 150 i_\sigma$$

$$\text{But } i_\sigma = -\frac{V_b}{150}$$

$$\therefore \boxed{V_a = -V_b}$$

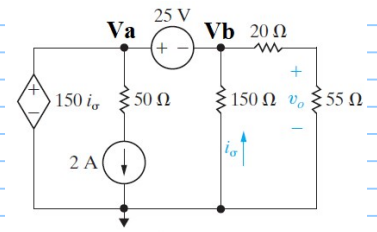
$$V_a - V_b = 25$$

$$-V_b - V_b = 25$$

$$\left. \begin{array}{l} V_a - V_b = 25 \\ -V_b - V_b = 25 \end{array} \right\} \boxed{V_b = -12.5V}$$

$$\boxed{V_a = 12.5V}$$

$$\rightarrow \boxed{V_o = \frac{55}{75} \quad V_b = -9.166V}$$



E.

$$-15V_{\Delta} + \frac{V_a - 50}{50} + 25 = 0$$

But  $V_{\Delta} = \frac{20}{20+55} V_b = \frac{4}{15} V_b$

then

$$-4V_b + \left(\frac{1}{50}\right)V_a - 1 + 25 = 0$$

$$\left(\frac{1}{50}\right)V_a - (4)V_b = -24 \quad \text{--- (1)}$$

$$-25 - \frac{1}{10}V_0 + \frac{V_b}{75} = 0$$

But

$$V_0 = V_a - 50$$

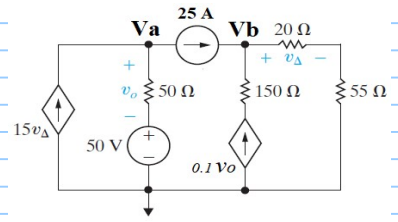
$$-25 - \frac{1}{10}(V_a - 50) + \frac{V_b}{75} = 0$$

$$-25 - \frac{1}{10}V_a + 5 + \frac{1}{75}V_b = 0$$

$$\left(-\frac{1}{10}\right)V_a + \left(\frac{1}{75}\right)V_b = 20 \quad \text{--- (2)}$$

$$V_a = -199.3 \text{ V}$$

$$V_b = 5.0033 \text{ V}$$



$$V_0 = V_a - 50 = -249.3 \text{ V}$$

F.

$$V_a - V_b = -25 \quad \text{--- (1)}$$

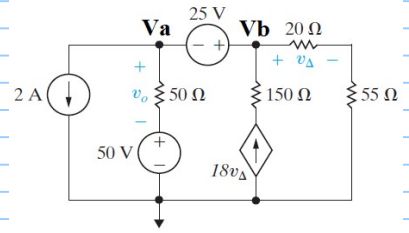
$$2 + \frac{V_a - 50}{50} - 18V_\Delta + \frac{V_b}{75} = 0$$

$$\text{But } V_\Delta = \frac{20}{20+55} V_b = \frac{4}{15} V_b \quad \curvearrowright$$

$$2 + \left(\frac{1}{50}\right)V_a - 1 - \frac{18 \times 4}{15} V_b + \frac{1}{75} V_b = 0$$

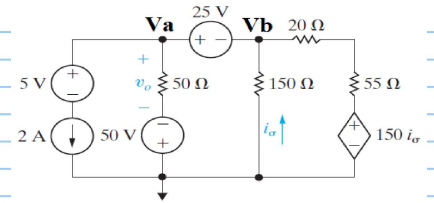
$$\frac{1}{50} V_a - \frac{359}{75} V_b = -1 \quad \text{--- (2)}$$

$$\begin{aligned} V_a &= -24.8543 \text{ V} \\ V_b &= 0.1456 \text{ V} \end{aligned}$$



$$\left. \begin{aligned} V_b &= V_a - 50 \\ &= -74.8543 \text{ V} \end{aligned} \right\}$$

G.



$$V_a - V_b = 25 \quad \text{--- (1)}$$

$$2 + \frac{V_a + 50}{50} + \frac{V_b}{150} + \frac{V_b - 150 i_\sigma}{75} = 0$$

But  $i_\sigma = -\frac{V_b}{150}$

then,

$$2 + \frac{1}{50} V_a + 1 + \frac{V_b}{150} + \frac{V_b}{75} + \frac{1}{75} V_b$$

$$\frac{1}{50} V_a + \frac{1}{30} V_b = -3 \quad \text{--- (2)}$$

$V_a = 71.875 \text{ V}$	$-46.62 \text{ V}$
$V_b = 46.875 \text{ V}$	$-65.62 \text{ V}$

$$V_o = \text{---}$$

$$= V_a + 50$$

H.

$$V_a - V_b = 25 \quad \text{--- (1)}$$

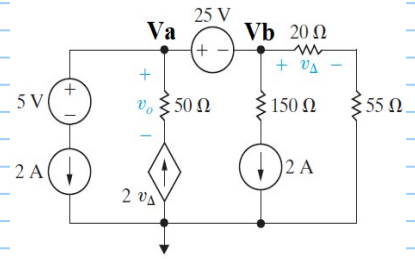
$$2 - 2V_{\Delta} + 2 + \frac{V_b}{75} = 0$$

But  $V_{\Delta} = \frac{20}{20+55} V_b$

$$2 - \frac{2 \times 20}{75} V_b + 2 + \frac{V_b}{75} = 0 \Rightarrow V_b = (-4) \left( -\frac{25}{13} \right)$$

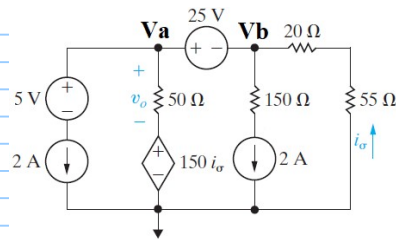
$$\begin{aligned} \text{oo} & \quad V_b = 7.6923 \text{ V} \\ \& \quad V_a = 32.6923 \text{ V} \end{aligned}$$

$$\left. \begin{aligned} v_o &= (50)(2V_{\Delta}) \\ &= -50 \times 2 \times \frac{20}{75} V_b \\ &= -205.128 \text{ V} \end{aligned} \right\}$$





I.



$$V_a - V_b = 25 \quad \text{--- (1)}$$

$$2 + \frac{V_a - 150 i_o}{50} + 2 + \frac{V_b}{75} = 0$$

$$\text{But } i_o = -\frac{V_b}{75}$$

$$\text{or } 2 + \left(\frac{1}{50}\right) V_a + \left(\frac{3}{75}\right) V_b + 2 + \left(\frac{1}{75}\right) V_b = 0$$

$$\left(\frac{1}{50}\right) V_a + \left(\frac{4}{75}\right) V_b = -4 \quad \text{--- (2)}$$

$$V_a = -36.3636 \text{ V}$$

$$V_b = -61.3636 \text{ V}$$

$$\left\{ \begin{aligned} v_o &= V_a - 150 i_o \\ &= V_a + \frac{156}{75} V_b \\ &= -159.09 \text{ V} \end{aligned} \right.$$

J.

$$V_a - V_b = 25 \quad \text{--- (1)}$$

$$2 + \frac{V_a - 50}{50} - 2V_\Delta - 2 = 0$$

$$\text{But } V_\Delta = -(2)(2) = -4 \text{ V.}$$

then

$$2 + \frac{1}{50}V_a - 1 + 8 - 2 = 0$$

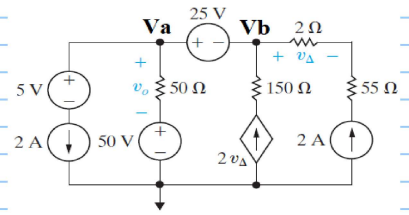
$$\frac{1}{50}V_a = -7$$

$$V_a = -350 \text{ V.}$$

$$V_b = V_a - 25$$

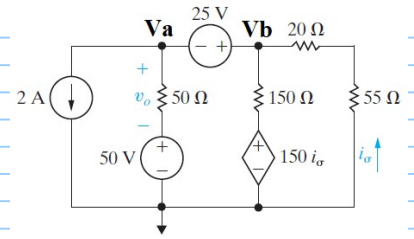
$$V_b = -375 \text{ V.}$$

→ ON ITC was 375 X



$$V_b = V_a - 50 = -400 \text{ V}$$

K.



$$V_a - V_b = -25 \quad \text{--- (1)}$$

$$2 + \frac{V_a - 50}{50} + \frac{V_b - 150i_\sigma}{150} + \frac{V_b}{75} = 0$$

$$\text{But } i_\sigma = \frac{-V_b}{75} \quad \uparrow$$

$$2 + \frac{V_a}{50} - 1 + \frac{V_b}{150} + \frac{V_b}{75} + \frac{V_b}{75} = 0$$

$$\begin{aligned} V_a &= -34.375 \text{ V} \\ V_b &= -9.375 \text{ V} \end{aligned}$$

$$\left(\frac{1}{50}\right)V_a + \left(\frac{1}{30}\right)V_b = -1 \quad \text{--- (2)}$$

$$V_o = V_a - 50$$

$$= -84.375 \text{ V}$$

L.

$$V_a - V_b = -25 \quad \text{--- (1)}$$

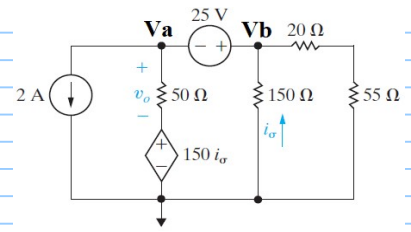
$$2 + \frac{V_a - 150 i_\sigma}{50} + \frac{V_b}{150} + \frac{V_b}{75} = 0$$

$$\text{But } i_\sigma = -\frac{V_b}{150} \quad \uparrow$$

then

$$2 + \left(\frac{1}{50}\right)V_a + \frac{V_b}{150} + \frac{V_b}{150} + \frac{V_b}{75} = 0$$

$$\left(\frac{1}{50}\right)V_a + \left(\frac{2}{75}\right)V_b = -2 \quad \text{--- (2)}$$



$$V_a = -57.14 \text{ V}$$

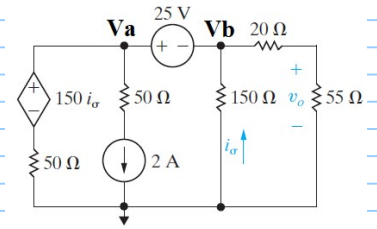
$$V_b = -32.14 \text{ V}$$

$$V_b = V_a - 150 i_\sigma$$

$$= V_a + V_b$$

$$= -89.28 \text{ V}$$

M.



$$\frac{V_a - 150i_\sigma}{50} + 2 + \frac{V_b}{150} + \frac{V_b}{75} = 0$$

But

$$i_\sigma = -\frac{V_b}{150}$$

then

$$\left(\frac{1}{50}\right)V_a + \frac{3}{150}V_b + 2 + \frac{V_b}{150} + \frac{V_b}{75} = 0$$

$$\left(\frac{1}{50}\right)V_a + \left(\frac{1}{25}\right)V_b = -2 \quad \text{--- (1)}$$

$$V_a - V_b = 25V \quad \text{--- (2)}$$

$$V_a = -16.66V$$
$$V_b = -41.66V$$

$$\rightarrow V_o = \frac{55}{75}V_b = -30.55V$$