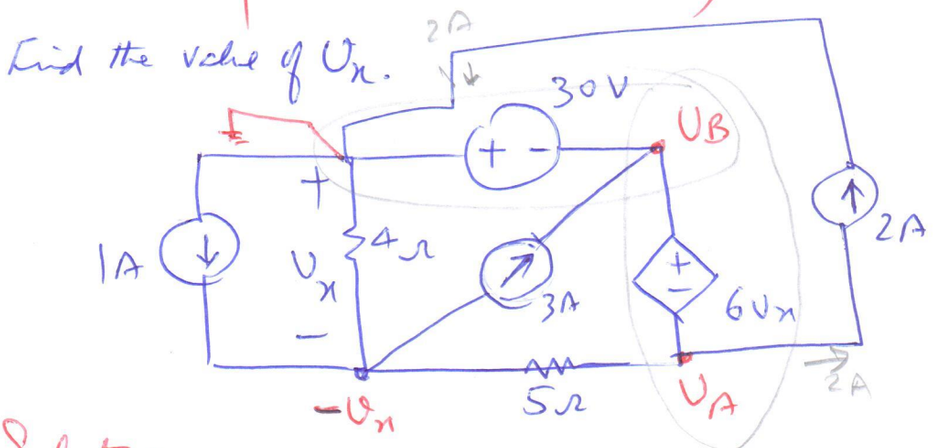
(Exam)

Example A1.3 KCL (Supernode)

(P 796 8th Ed Hkl)

Find the value of V_x.



Solution: Applying KCL at V_x?

$$-1-\frac{V_x}{4}+3+\frac{-V_x-V_A}{5}=0$$

Now $V_A=-30-6V_x$

$$-1-\frac{V_x}{4}+3+\frac{-V_x+30+6V_x}{5}=0 \qquad \times 20$$

$$-20-5V_x+60+20V_x+120=0$$

$$15V_x=-160$$

$$V_x=-\frac{160}{5}\ 32$$

$$V_x=-\frac{32}{3}\ \text{Volts}$$

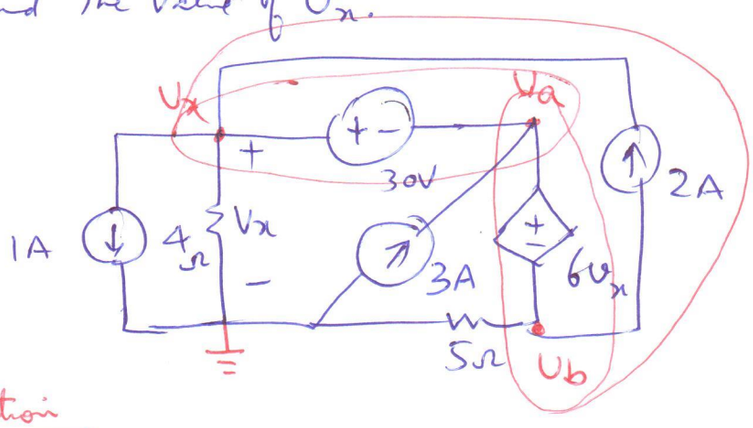
contd

(Concept)

Example A1.3 KCL (Supernode) (Different Reference)

(PP 796 8th Ed HKJ)

Find the Value of v_x.



Solution:

KCL at Supernode $\quad 1 + \frac{v_x}{4} - 3 + \frac{v_b}{5} = 0 \quad$ or $\quad \frac{v_x}{4} + \frac{v_b}{5} = 2 \quad \times 20$

$$5v_x + 4v_b = 40 \quad \text{——} (1)$$

Constraint eqns

$$v_x - v_a = 30 \quad \text{or} \quad v_a = v_x - 30$$

$$v_a - v_b = 6v_x$$

So $\quad v_x - 30 - v_b = 6v_x$

$$5v_x + v_b = -30 \quad \text{——} (2) \quad \times 4$$

$$\begin{cases} 5v_x + 4v_b = 40 & \text{——} (3) \\ 20v_x + 4v_b = -120 \end{cases}$$

$$-15v_x = 160$$

$$v_x = -\frac{32}{3} \text{ Volts.}$$

as before