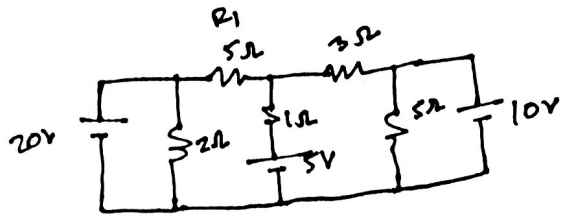
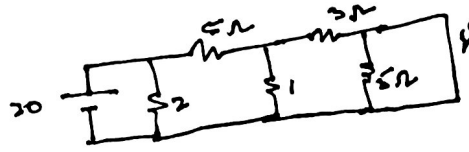
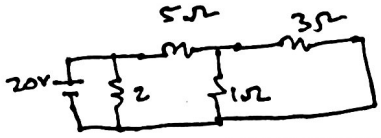
Solution to Problem 1

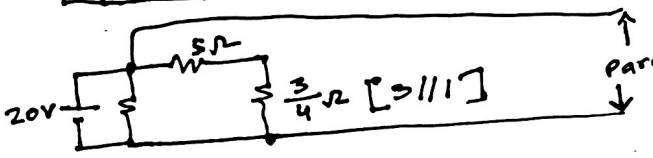


Using superposition and considering 20V source:



due to this short circuit the resistance R_4 is ignored



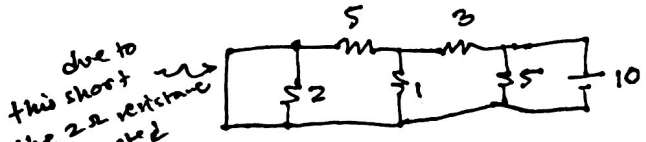


∴ drop accross 5Ω and $\frac{3}{4}$Ω is 20V.

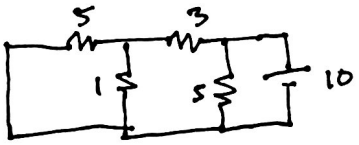
∴ Applying VDR, $V_{R_1}' = \frac{5}{5+\frac{3}{4}} \times 20 = 17.4V$

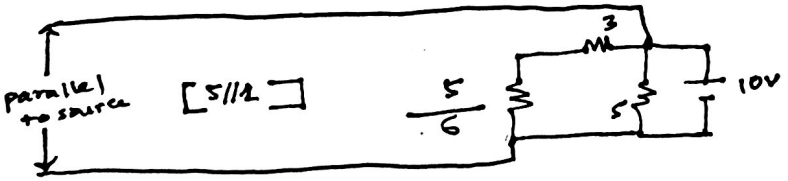
→ R_1 (+ V_{R_1}' −)

considering the 10V source:



due to this short the 2Ω resistance is shorted



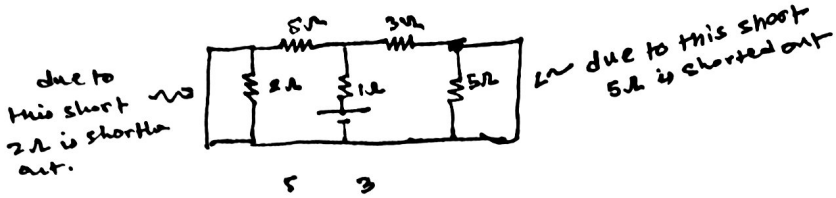


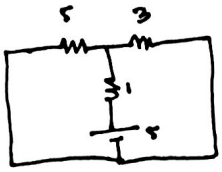
drop accross 5/6Ω

$$\frac{\frac{5}{6}}{3+\frac{5}{6}} \times 10 = 2.17V$$

∴ $V_{R_1}'' = 2.17V$ (− + ←)

considering 5V source:



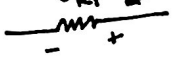


$[5 \| 3 \quad] \; \frac{15}{8}\,\Omega$

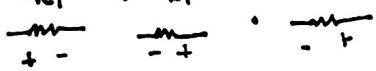
$$V_{R_1}''' = \frac{15/8}{1 + 15/8} \times 5$$

$$= 3.26\text{V}$$

V_{R_1}''' ←



$$V_{R_1} = V_{R_1}' + V_{R_1}'' + V_{R_1}'''$$



$$\therefore V_{R_1} = 17.4 - 2.17 - 3.26$$

$$= 11.97\text{V}$$

$\rightarrow +V_{R_1}-$