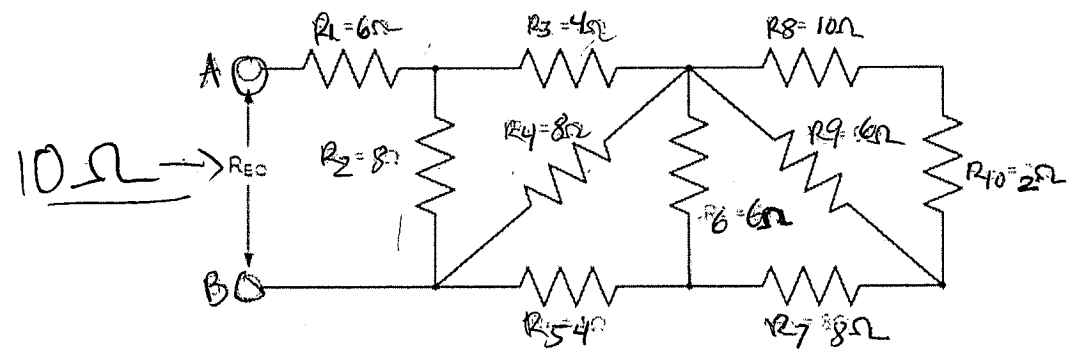
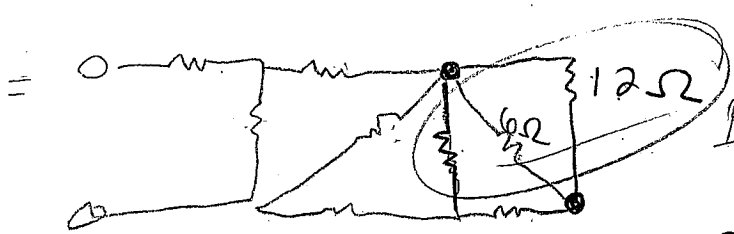
ENGR 12 TEST 1 100 Points NAME: Emma Stavropoulos

Closed Book. One double sided sheet of notes and a calculator are allowed.

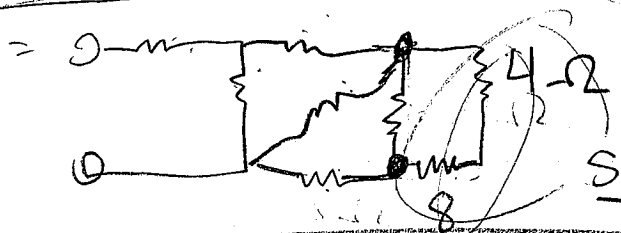
1) Find the effective resistance Req in the network below (it's easier than it may look at first).



R8, R10 → series
10 + 2Ω
= 12Ω

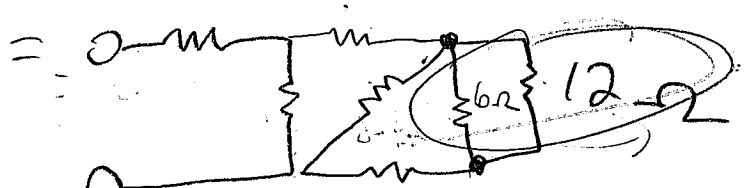


parallel



$\frac{2}{12} + \frac{1}{12} = \frac{3}{12} \rightarrow 4\Omega$

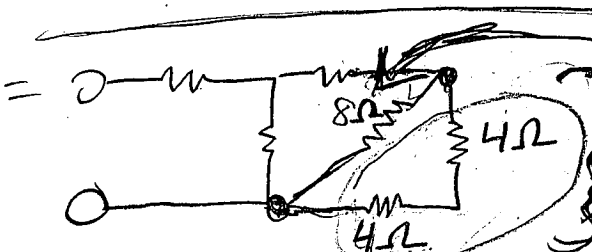
series, 4 + 8 = 12Ω



→ parallel,

$\frac{1}{12} + \frac{2}{12} = \frac{3}{12}$

→ 4Ω



② parallel,

$\frac{1}{8} + \frac{1}{8} = \frac{2}{8}$

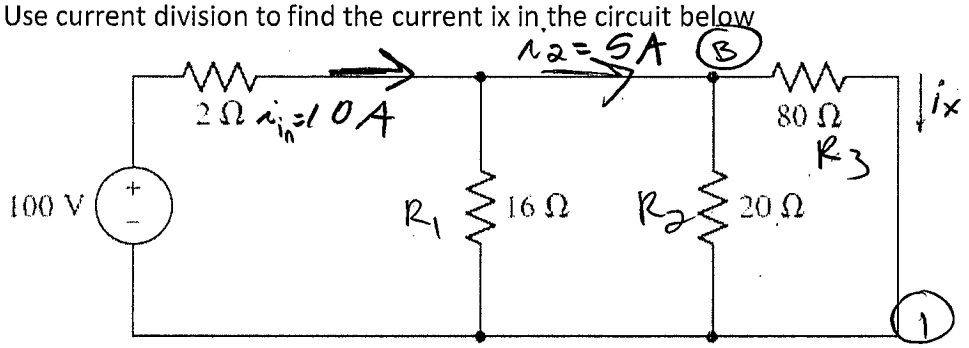
R = 4Ω

① series, 8Ω

① series, 8Ω ② parallel, 4Ω

Req = 10Ω

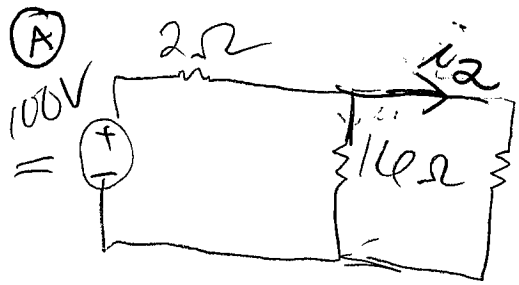
2) Use current division to find the current ix in the circuit below



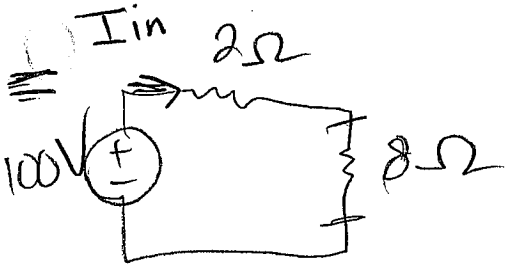
R_2, R_3 parallel

$\frac{1}{80} + \frac{4}{80} = \frac{5}{80}$

$\frac{80}{5} = 16\Omega$



16Ω



② $\rightarrow$ $10\Omega = R_{eq}$

$V = RI \rightarrow I = V/R = \frac{100}{10}$

$I_{in} = 10A$

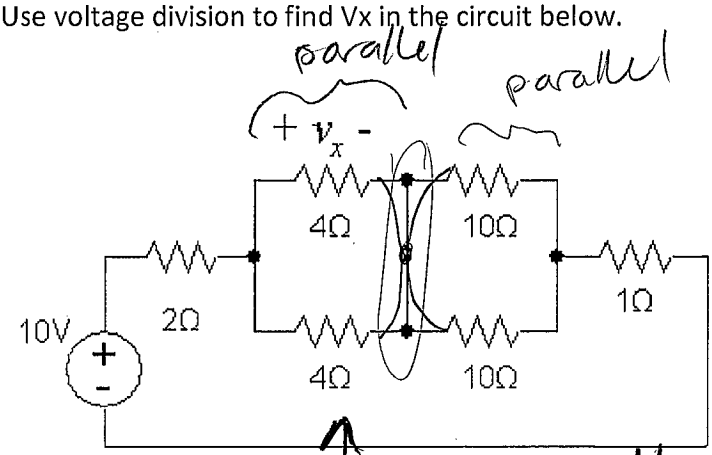
③ Current-divider

Ⓐ $i_2 = i_{in}\left[\frac{R_1}{R_1+R_2}\right] = 10A\left[\frac{16\Omega}{32\Omega}\right] = 5A$

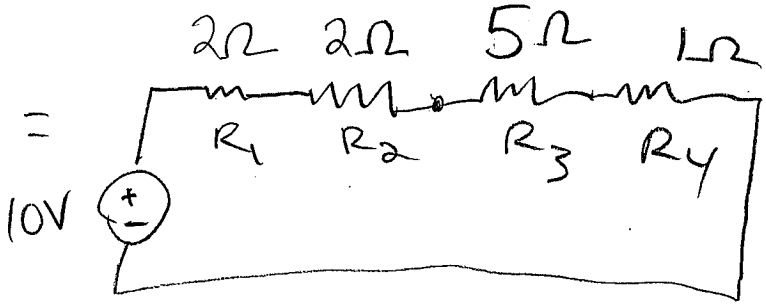
Ⓑ $i_x = i_2\left[\frac{R_2}{R_2+R_3}\right] = 5A\left[\frac{20\Omega}{100\Omega}\right] = 1A$

$\boxed{i_x = 1.0\ A}$

3) Use voltage division to find Vx in the circuit below.



same voltage, parallel



$$V_x = V_{in}\left[\frac{R_2}{R_1+R_2+R_3+R_4}\right]$$

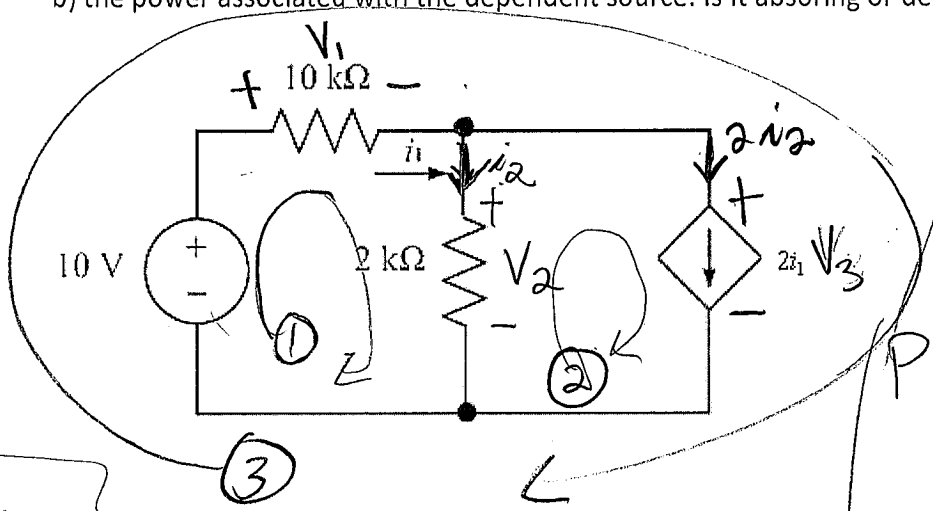
$$= 10V\left[\frac{2}{2+2+5+1}\right] = \frac{10\cdot 2}{10}$$

$$V_x = 2.0\ V$$

4) Find

a) the current i1 = 1.25mA

b) the power associated with the dependent source. Is it absoring or delivering power ? P=-6.25mW delivering



$V_3 = -2.5\,V$

$P = +IV$ (Passive)

$= (2)i_1(V_3)$

$= (2)(1.25mA)(-2.5V)$

$P = -6.25\,mW$ delivering

KCL

$i_1 = i_2 + 2i_1 \rightarrow i_2 = -i_1$

KVL

1) $-10V + V_1 + V_2 = 0$

2) $-V_2 + V_3 = 0$

3) $-10V + V_1 + V_3 = 0$

OL

$V_1 = R_1 I_1 = (10k\Omega)i_1$

$V_2 = R_2 I_2 = (2k\Omega)i_2$

$= (2k\Omega)(-i_1)$

1) $-10V + 10{,}000i_1 - 2000i_1 = 0 \rightarrow i_1 = \frac{10V}{8000\Omega} = 1.25mA$

2) $2000i_1 + V_3 = 0 \Rightarrow V_3 = -2000i_1 = -2k\Omega(1.25mA)$

$V_3 = -2.5V$

3) $-10V + 10{,}000i_1 + V_3 = 0$

$i_1 = 1.25\,mA$ ✓

$V_3 = -2.5\,V$ ✓