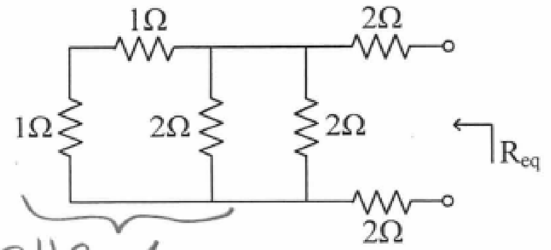
(a) Find the R_{eq} in the following circuit.

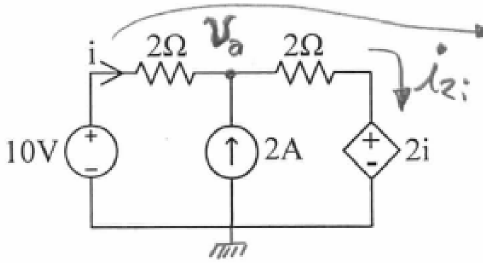
$$R_{eq} = 2 + 2 + 2 \parallel 1$$
$$= 4 + \frac{2 \cdot 1}{2+1} = \frac{14}{3} \Omega$$



$2 \parallel 2 = 1 \Omega$

$R_{eq} =$ $14/3 \ \Omega$

(b) In the following circuit, find i and the power absorbed or delivered by 2i dependent source.



Ohm's law : $i = \dfrac{10 - v_a}{2}$

$i =$ $1 \ A$

$P =$ $6 \ W$

KCL @ v_a

$$2 = \frac{v_a - 10}{2} + \frac{v_a - 2i}{2}$$

$$4 = v_a - 10 + v_a - 2\left(\frac{10 - v_a}{2}\right)$$

$$4 = 2v_a - 10 - 10 + v_a$$

$$24 \ V = 3 v_a$$

$$\boxed{v_a = 8 \ V}$$

Absorbed X Delivered ____

$$\therefore \ i = \frac{10 - 8}{2} = 1 \ A$$

Absorbed :

$$P_{2i} = (2i)(i_{2i})$$

$$i_{2i} = \frac{v_a - 2i}{2} = \frac{8 - 2\left(\frac{10-8}{2}\right)}{2} = \frac{8 - 10 + 8}{2} = 3 \ A$$

$$P_{2i} = (2V)(3A) = 6 \ W \quad (\text{absorbed})$$

(a) *(4 pts)* A complex number Z is given as

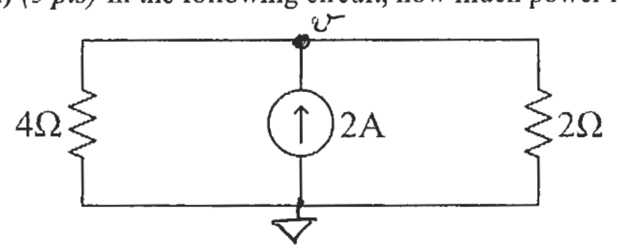
(i) $Z = (1+j)^3$ find $|Z| =$ $2\sqrt{2}$ $\angle Z =$ 135°

$= \left(\sqrt{2}e^{j45^\circ}\right)^3 = 2\sqrt{2}\angle 135^\circ$

(ii) $Z = (1-j)e^{-j\pi/4}$ find $|Z| =$ $\sqrt{2}$ $\angle Z =$ -90°

$= \sqrt{2}e^{-j45^\circ} \cdot e^{-j45^\circ} = \sqrt{2}\angle -90^\circ$

(d) *(5 pts)* In the following circuit, how much power is supplied by 2A source.



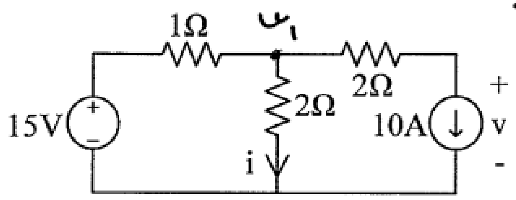
$\frac{v}{4\Omega} + \frac{v}{2\Omega} = 2A$

$\frac{3}{4}v = 2A \Rightarrow v = \frac{8}{3}V$

$P(\text{supplied}) = (2A)(v) = \frac{16}{3}W$

P = $16/3$ W

(a) In the following circuit, find v and i.



$\frac{v_1}{2} + 10 + \frac{v_1 - 15}{1} = 0$

$\frac{v_1}{2} + v_1 = 15 - 10 = 5$

$\frac{3v_1}{2} = 5$

$v_1 = \frac{10}{3}\,V$

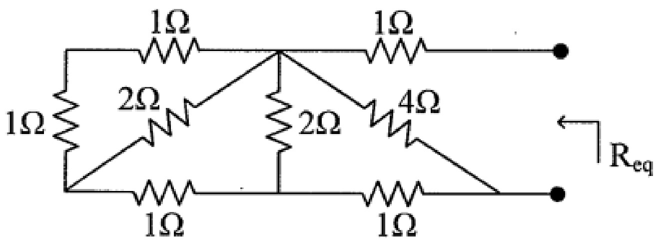
$v_1 - 2 \cdot 10 = v = -\frac{50}{3}$

$i = \frac{10/3}{2} = \frac{10}{6}$

v = $-\frac{50}{3}\,V$

i = $5/3\ A$

(b) Find R_{eq} in the following circuit.



$1+1=2$

$2 // 2 = 1$

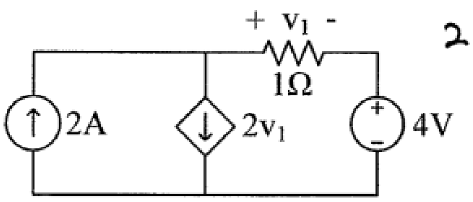
$1+1 = 2$

$2 // 4 = 8/6$

$\frac{8}{6} + 1 = \frac{14}{6} = R_e$

R_{eq} = $7/3\ \Omega$

(c) For the circuit below, find v_1 and the power, absorbed or delivered by 4V source.



$2v_1 + v_1 = 2$

$3v_1 = 2$

$v_1 = 2/3\ V$

$i = \frac{2/3}{1} = \frac{2}{3}$

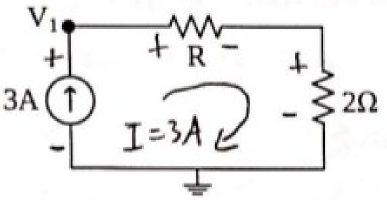
$P = 4 \cdot 2/3$

v_1 = $2/3\ V$

P = $8/3\ W$

absorbed ✓ delivered ____

(a) Consider the circuit below. Determine the value of the resistance R and of the node voltage V_1 if the absorbed power by that resistor R is 3W.



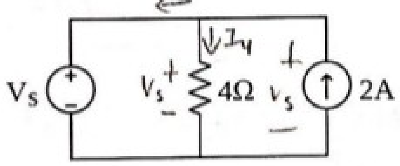
$P_R = RI^2 = R(3)^2 = 9R = 3 \Rightarrow R = \frac{3}{9} = \frac{1}{3}$

KVL: $V_1 = V_R + V_{2\Omega} = RI + 2I = (R+2)I$
$= (R+2)3 = (\frac{1}{3}+2)3 = 7$

R = $1/3\ \Omega$

V_1 = 7 V

(b) Consider the circuit below. Determine the value of V_S and the absorbed power at the voltage source if the absorbed power at the current source is 6W. (indicate if this power is absorbed or injected) I_S



$P_{2A} = VI = V_s(-2) = -2V_s = 6 \Rightarrow V_s = \frac{-6}{2} = -3$

because non SRS

Need I_s for $P_s = V_s I_s$

KCL: $2 = I_s + I_4 = I_s + \frac{V_s}{4}$

$\Rightarrow I_s = 2 - \frac{V_s}{4} = 2 - \frac{(-3)}{4} = \frac{8+3}{4} = \frac{11}{4}$

$\Rightarrow P_s = V_s I_s = -3\left(\frac{11}{4}\right) = \frac{-33}{4}$

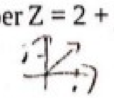
V_s = −3 V

P_s = −33/4 W

☐ absorbed ☒ injected because < 0

(c) Determine the magnitude and phase of the complex number $Z = 2 + j6 + (1 + j)^6$.

$1+j = \sqrt{1^2+1^2}\, e^{j\tan^{-1}(\frac{1}{1})} = \sqrt{2}\, e^{j\frac{\pi}{4}}$



$\Rightarrow Z = 2 + j6 + (\sqrt{2}e^{j\pi/4})^6 = 2 + j6 + 2^{\frac{6}{2}} e^{j\frac{\pi 6}{4}}$

$= 2 + j6 + 2^3 e^{j3\pi/2} = 2 + j6 + 8(-j)$

$= 2 - 2j = \sqrt{2^2 + (-2)^2}\, e^{j\tan^{-1}(\frac{-2}{2})}$

$= 2\sqrt{2}\, e^{-j\pi/4}$

|z| = $2\sqrt{2}$

∠Z = $-\pi/4$ rad