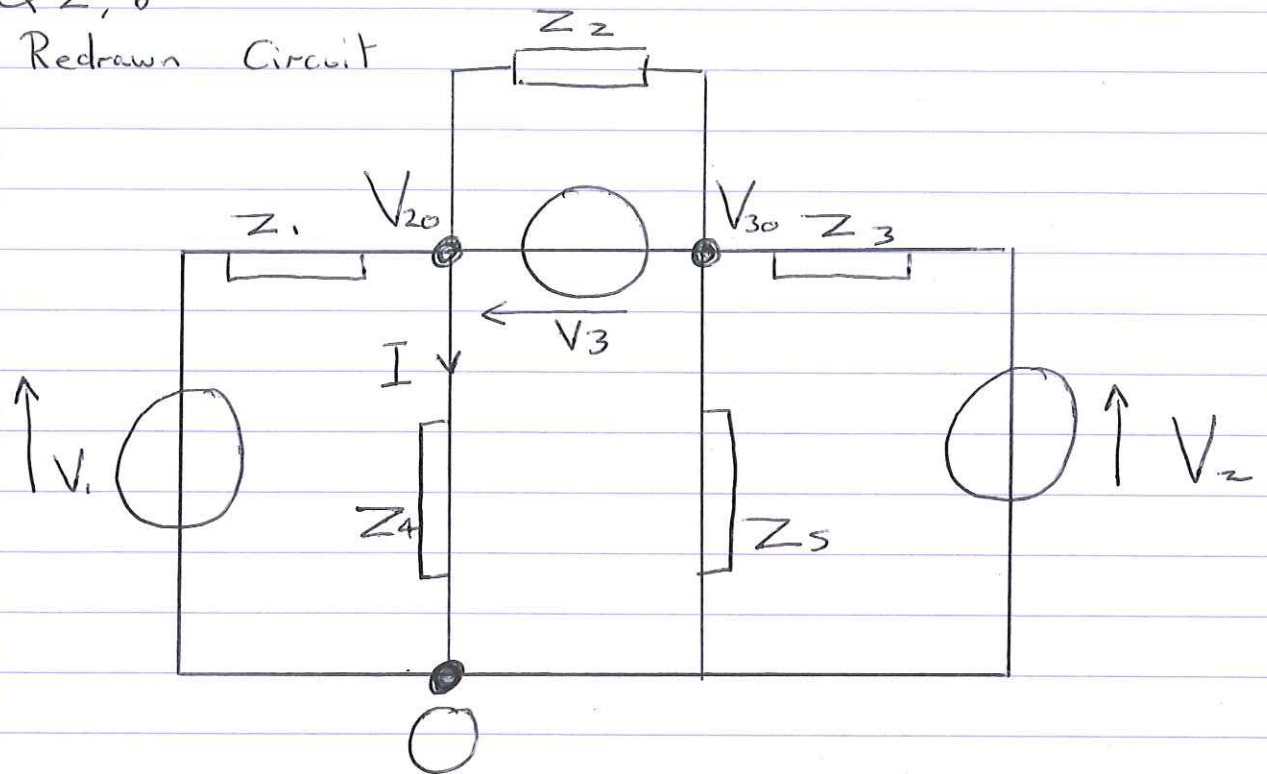


Q2, b

Redrawn Circuit



$$V_{20} - V_{30} = 20 \angle 45 \quad \text{or} \quad 14.14 + j14.14 \text{ V}$$

$$\text{Current in } Z_2 = \frac{20 \angle 45}{5 \angle 90} = 4 \angle -45$$

$$\text{or } 2.83 \text{ to 2 dp} + j2.83 \text{ to 2 dp}$$

$$\sum 0 = \frac{V_1 - V_{20}}{Z_1} - \frac{V_{20}}{Z_4} - \frac{V_{30}}{Z_5} + \frac{V_2 - V_{30}}{Z_3}$$

$$V_{30} = V_{20} - V_3$$

Q26

$$0 = \frac{V_1}{Z_1} - \frac{V_{20}}{Z_1} - \frac{V_{20}}{Z_4} - \frac{V_{30}}{Z_5} + \frac{V_2}{Z_3} - \frac{V_{30}}{Z_3}$$

$$\frac{V_1}{Z_1} = \frac{120}{2} = 60$$

$$\frac{V_2}{Z_3} = \frac{I 120}{4} = I 30$$

So

$$0 = 60 - \frac{V_{20}}{Z_1} - \frac{V_{20}}{Z_4} - \frac{V_{30}}{Z_5} + I 30 - \frac{V_{30}}{Z_3}$$

$$60 + I 30 = \frac{V_{20}}{Z_1} + \frac{V_{20}}{Z_4} + \frac{V_{30}}{Z_5} + \frac{V_{30}}{Z_3}$$

$$V_{20} \left( \frac{1}{Z_1} + \frac{1}{Z_4} \right) + V_{30} \left( \frac{1}{Z_5} + \frac{1}{Z_3} \right)$$

$$V_{20} \left( 0.5 - \frac{1}{I 5} \right) + V_{30} \left( \frac{1}{I 4} - 0.25 \right)$$

$$\frac{1}{-I 5} = \frac{1}{-I 5} \times \frac{I 5}{I 5} = \frac{-I 5}{25} = I 0.2$$

So

$$V_{20} (0.5 + I 0.2)$$

$$\frac{1}{I_4} = \frac{I_4}{-16} - I_{0.25}$$

$$V_{30} (0.25 - I_{0.25})$$

$$V_{20} (0.5 + I_{0.2}) + V_{10} (0.25 - I_{0.25})$$

$$V_{30} = V_{20} - V_3$$

$$-V_3 = 20 \angle -135$$

$$0.25 - I_{0.25} = 0.35 \angle -45$$

So

$$20.35 \angle -180 = -20.35 + I_0$$

$$80.35 + I_{30} = V_{20} (0.5 + I_{0.2})$$

$$+ V_{20} (0.25 - I_{0.25})$$

$$V_{20} (0.75 - I_{0.05})$$

So

$$\frac{80.35 + I_{30}}{0.75 - I_{0.05}} = V_{20}$$

Q2 b)

$$\underline{85.77 \angle 20}$$

$$0.752 \angle 3.8$$

$$114.06 \angle 16.2$$

$$= 109.5 + j31.8$$

$$\frac{114.06 \angle 16.2}{-j5} = \frac{114.06 \angle 16.2}{5 \angle -90}$$

$$22.812 \angle \cancel{0} - 73.8 \angle 106.2$$