

For the system below, the source is represented in phasor-notation as:

$$\mathbf{Z}_1 = A_1 + jB_1 \quad \mathbf{V}_S = A_2 \cdot e^{jB_2}$$

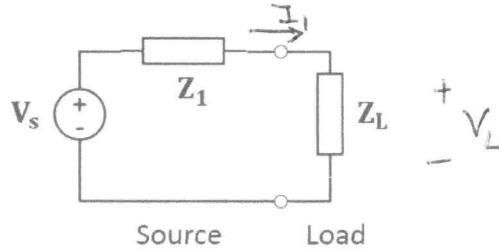
A1 : 1 ohm

B1 : -8 ohm

A2 : 4 V

B2 : 65 degrees

- (a) Find the load impedance  $\mathbf{Z}_L = A_3 + jB_3$  that results in the maximum power being received by this load.  
 (b) Find the maximum average power  $P$  received by the load.



(a)  $\mathbf{Z}_L = \mathbf{Z}_1^* \Rightarrow \mathbf{Z}_L = 1 + j8$

$A_3 = 1 \Omega$
$B_3 = 8 \Omega$

(b)  $\mathbf{I}_1 = \frac{\mathbf{V}_S}{\mathbf{Z}_1 + \mathbf{Z}_L} \quad \mathbf{Z}_1 + \mathbf{Z}_L = 2$

$\mathbf{V}_S = 4 e^{j65^\circ} \quad \mathbf{V}_L = \mathbf{Z}_L \cdot \mathbf{I}_1$

$$S_L = \frac{1}{2} \mathbf{V}_L \cdot \mathbf{I}_1^* = \frac{1}{2} \mathbf{Z}_L \cdot \mathbf{I}_1 \cdot \mathbf{I}_1^* = \frac{\mathbf{Z}_L}{2} |\mathbf{I}_1|^2 = \frac{\mathbf{Z}_L}{2} \frac{|\mathbf{V}_S|^2}{|\mathbf{Z}_1 + \mathbf{Z}_L|^2}$$

$$= \frac{(1+j8)}{2} \cdot \frac{4^2}{2^2} = (1+j8) \cdot 2 = \underbrace{2}_P + \underbrace{16j}_Q$$

$P = 2 \text{ W}$
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