

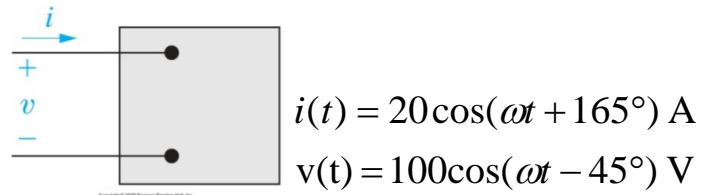


**COLORADO SCHOOL OF MINES**  
**ELECTRICAL ENGINEERING DEPARTMENT**

**EENG 577**

**M1 Quiz KEY**

**Question 1:** Consider the system below, find the average power, the reactive power, and the power factor.



$$P = \frac{V_m I_m}{2} \cos(\theta_v - \theta_i) = \frac{(20)(100)}{2} \cos(-45^\circ - 165^\circ) = -866 \text{ W (Generating)}$$

$$Q = \frac{V_m I_m}{2} \sin(\theta_v - \theta_i) = \frac{(20)(100)}{2} \sin(-45^\circ - 165^\circ) = 500 \text{ var (Consuming)}$$

$$\text{pf} = \cos(\theta_v - \theta_i) = \cos(-45^\circ - 165^\circ) = -0.866$$

**Lagging PF since it is consuming reactive power**

**Question-2:** A load has a voltage  $\mathbf{V} = 208 \angle -30^\circ \text{ V}$  and the current  $\mathbf{I} = 2 \angle 20^\circ \text{ A}$ . The load power factor is about:

- a) 0.24 Lagging   b) 0.51 Leading   c) 0.64 Leading   d) None of the above

**Solution:**  $Z = V/I = 208 \angle -30^\circ / 2 \angle 20^\circ = 104 \angle -50^\circ$

$\text{PF} = \cos(-50^\circ) = 0.643 \text{ Leading}$

**Question 3:** A balanced 3-phase load  $Z = 4 + j3 \, \Omega/\text{phase}$  is Y-connected to a balanced 550 V (L-L) Source, with abc sequence. The line current  $\mathbf{I}_a$  is about:

- a)  $64 \angle -37^\circ \text{ A}$    b)  $23 \angle -27^\circ \text{ A}$    c)  $95 \angle -45^\circ \text{ A}$    d) None of the above

**Solution**

$$Z = 4 + j3 = 5 \angle 36.9^\circ$$

$$V_{AN} = 550 / \sqrt{3} = 317.5 \angle 0^\circ \text{ V}$$

$$\mathbf{I}_L = \mathbf{I}_a = 317.5 \angle 0^\circ / Z = 63.5 \angle -36.9^\circ \text{ A}$$

