

# KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

## ELECTRICAL ENGINEERING DEPARTMENT

Dr. Ibrahim O. Habiballah

EE-306

### Key Solution

Quiz 1          Sec.: 4          I.D.:          Ser#:          Name:

Q.1 A three-phase 460 V substation bus supplies two connected loads that are connected in parallel. Load 1 (Y-connected) draws 40 kW at 0.8 leading power factor, and load 2 (delta-connected) draws 50 kVA at 0.6 lagging power factor.

Total real and reactive power supplied by the substation bus is

- a.  $P = 70.0 \text{ kW}$  ;  $Q = 10.0 \text{ kVAR (inductive)}$
- b.  $P = 70.0 \text{ kW}$  ;  $Q = 10.0 \text{ kVAR (capacitive)}$
- c.  $P = 62.0 \text{ kW}$  ;  $Q = 90.0 \text{ kVAR (inductive)}$
- d.  $P = 62.0 \text{ kW}$  ;  $Q = 90.0 \text{ kVAR (capacitive)}$

$$P_{\text{total}} = 40 + 50(0.6) = 70 \text{ kW}$$

$$Q_{L1} = 40 * (\sin (\cos^{-1}(.8))/0.8) = 30 \text{ kVAR (capacitive)}$$

$$Q_{L2} = 50 \sin (\cos^{-1}(.6)) = 40 \text{ (inductive)}$$

$$Q_{\text{total}} = -30 + 40 = 10 \text{ kVAR (inductive)}$$

Q.2 For a Delta-Wye balanced three-phase source-load connection

- a. the source line-current magnitude equals the load phase-current magnitude.
- b. the source line-voltage magnitude equals the load line-voltage magnitude.
- c. the source phase-voltage magnitude equals the load line-voltage magnitude.
- d. all of the above