2. (38 pts) A single-phase, 60-Hz, 240-V generator is connected to two loads. The generator provides 2500W and 11A. In order to find the following, you may have to make some assumptions. If you do, be sure to clearly state your assumption in such a way that I can tell that you know what the other assumption might be.

   a) Load 1 consumes 1500W at a power factor of 0.8. Find the complex power consumed by load 2.

   Hint: DRAW the circuit ! If you're not sure of your drawing, ask Arn & he'll tell you if it is correct.

   Don't forget to indicate your assumptions, if you made any.

   b) Load 2 can be modeled as 2 parts. Draw a model and find the values of the parts. Find actual component values, not just reatances in Ω.

c) The generator is now moved some distance away from the loads and the power is now delivered to the loads via an extension cord. Unfortunately this cord has the following resistance and reactance.

$R_{cord} := 1.5 \cdot \Omega$ $X_{cord} := 3 \cdot \Omega$

The generator voltage will need to be increased a bit to if we want the voltage at the loads to remain the same ($240V$). Then the load currents and powers will also remain the same. What should this new generator voltage be?
Hint: DRAW the new circuit !

d) An additional component is added in parallel to the loads to completely correct the power factor of both. This component is added at the load-end of the extension cord. Assume the generator voltage will be adjusted so that the voltage at the loads will remain the same ($240V$). Find the type and value of the component.

e) Now that the power factor is corrected at the loads, the current in the extension cord will be: i) less than $11A$ ii) still $11A$ iii) more than $11A$

(Circle one answer)

f) Now that the power factor is corrected at the loads, the adjusted voltage at the generator should be: i) less than found in part c) ii) the same as found in part c) iii) more than found in part c)

_____ / 38

Answers

2. a) IF you assume I_S lags V_S and L1 pf is lagging $(1 - 0.277 \cdot j) \cdot kVA$

b) Parallel R & C $57.6 \cdot \Omega$ $12.74 \cdot \mu F$ Series R & C $53.5 \cdot \Omega$ $179 \cdot \mu F$

c) $267.5 \cdot V$ d) $39 \cdot \mu F$ e) i) f) i