EE544 HW2

1. Refer to problem 1 HW 1

a. Now use the Ranade method

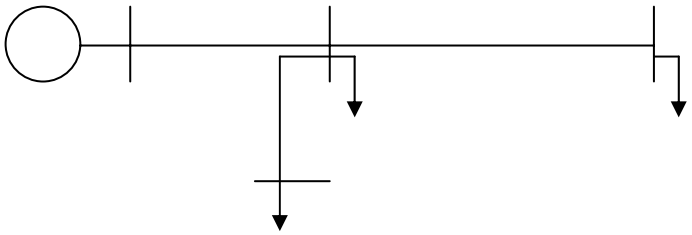
Assume the source impedance is j0.001 pu.
Ignoring loads and converting the voltage source at Bus 1 to a current source calculate the admittance(Y) and impedance(Z) matrices.
Guess suitable values for v2 and v3
1. Compute load currents
2. Solve I = Y V for V
3. set v2 and v3 to the values calculated in step 2 (v1 better be ??)
Repeat 1-3 to convergence to 3 decimal places.

b. Now use Kersting's 'ladder method' for radial systems

Assume v1 = 1 pu
1. Calculate the current from bus 2 to bus 3
2. Calculate v2
3. Calculate the current from bus 1 to bus 2
4. Calculate v1
5. Compare v1 with the specified value of v1=1; use the difference(error) to come up with a new guess v3

Repeat steps 1-5 until the calculate v1 = 1 to 3 decimal places.

c. How would you modify the ladder method for the system below?



The analysis of three-phase, unbalanced, systems will involve merely reinterpreting the impedances as 3x3 or 4x4 matrices and bus voltage and injected current as a 3- or 4-element vector.

2.5 A single-phase lateral serves four transformers as shown in Figure 2.15. Assume that each customer's maximum demand is 15.5 kW + *j*7.5 kVAr. The impedance of the single-phase lateral is z = 0.4421 + *j*0.3213 Ω/1,000 ft The four transformers are rated as:

T1 and T2: 37.5 kVA, 2,400–240 volts, Z = 0.01 + *j*0.03 per unit

T3 and T4: 50 kVA, 2,400–240 volts, Z = 0.015 + j0.035 per unit

Use the DFs found in Table 2.2 and determine:

1. The 15-minute maximum diversified kW and kVAr demands on each transformer
2. The 15-minute maximum diversified kW and kVAr demands for each line section
3. If the voltage at Node 1 is 2,600/0 volts, determine the voltage at nodes 2, 3, 4, 5, 6, 7, 8, and 9. In calculating the voltages, take into account diversity using the answers from 1 and 2 above.

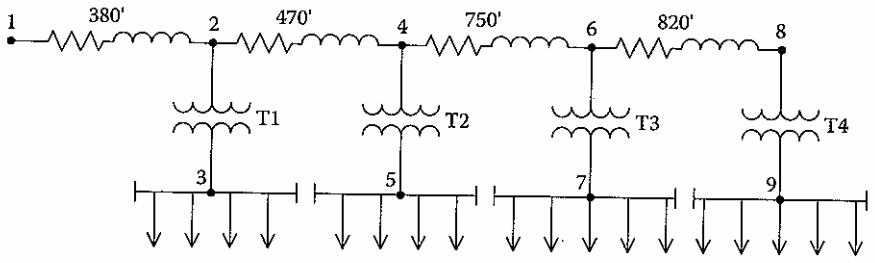


FIGURE 2.15
System for Problem 2.5.

6. Take the maximum diversified demand from node 1 to node 2 and allocate that out to each of the four transformers based upon their kVA ratings. To do this, take the maximum diversified demand and divide by 175 (total kVA of the four transformers). Now multiply each transformer kVA rating by that number to give how much of the total diversified demand is being served by each transformer. Again, calculate all of the voltages.