CMGT 235 – Electrical and Mechanical Systems
Homework #23 – Voltage Drop
Due: 11/10/2022
Points: 20

Name: Solution

NEC 2017 Edition, Chapter 9 Tables
Conductor Resistance
Table 8 Conductor Properties – for DC
Table 9 Alternating-Current Resistance – for AC

1. Determine both the resistance and the reactance in Ω/kft of the 600V, 500kcmil, copper cables used within a 3Φ circuit at a temperature of 75°C if the cables are enclosed in an aluminum conduit.

   X_L (Reactance) = 0.039 Ω/kft

   R (Resistance) = 0.032 Ω/kft

2. A feeder has a 100-ampere continuous load. The system source is 240 volts, 3-phase, and the supplying circuit breaker is 125 amperes. The feeder is in a trade size 1 ¼ in. aluminum conduit with three 1 AWG THHN copper conductors operating at their maximum temperature rating of 75°C. The circuit length is 150 ft, and the power factor is 85 percent.

   A. Use Table 9 COLUMN "Effective Z at 0.85 PF for Uncoated Copper Wires":

      Z = 0.16 ohm per 1000 ft

   B. Calculate the line-to-neutral voltage drop:
      VD (line-to-neutral) = Z x (circuit length / 1000 ft) x circuit Load

      VD (line-to-neutral) = 0.16 Ω/kft x (150 ft / 1000 ft) x 100 A = 2.40 V

   C. Calculate the voltage present at the load end of the circuit:

      V_{load}= 240 V - 4.157 V = 235.84 V

3-phase
Voltage drop (line-to-line) = voltage drop (line-to-neutral) x √3 = 2.40 V x 1.732 = 4.157 V