Ongoing List of Topics:

- URL: http://www.ece.mtu.edu/faculty/bamork/EE5223/index.htm
- Labs - EE4224/5224 - First pre-Lab later in Week 3
- Term Project - form teams of ~3, begin in week 4 or 5.
- Radial Protection (read sections 12.5, 12.6, also G&S Ch.10)
- Type 51 (inverse time-overcurrent relay) settings
- Instrument transformers: VTs, CTs, CCVTs, MOCTs, etc.
- CTs - pedestal vs. bushing
- CT saturation & accuracy, ratios, multi-ratio CTs
2. [20 pts] Two time-overcurrent relays protect adjacent sections of a radial system. Bus 3 is at the end of the radial line. 7000 amps of fault current will flow for a fault at point A; 5000 amps for a fault at point B. Load currents at buses 2 and 3 are 100A and 350A respectively. Loads at buses 2 and 3 have the same power factor.

![Electrical Diagram]

a) Determine the tap settings for the relays at buses 1 and 2. Assume that taps can be set so they are just above rated load current. Available tap settings are: 1.0, 1.2, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 5.0, 6.0, 7.0, 8.0, 10.0, and 12.0 amps.

\[
I_{R2} = \frac{350}{100/5} = 4.375 \text{A} \\
I_{R1} = \frac{450}{60/5} = 3.75 \text{A}
\]

Max 5-5

\[\text{Max} \leq 5 \text{ S} \leq \text{Max} \]

b) Keeping in mind that the relay at bus 2 protects the last section at the end of the line, what must its time dial setting be? Why?

c) Based on the fault at point A, what should the time dial setting be for the relay at bus 1? Assume that the circuit breakers operate in 4 cycles, and that the CTI is 0.25 seconds.

d) How long will it take for the relay at bus 1 to pick up for a fault at point B if the relay at bus 2 fails to operate?
Fig. 15. Typical Time Curve of the Type CO-9 Relay
MINIMUM MELTING TCC

Curves of M-E fuse links in M-E cutouts

Basis for data: NEMA Standard SG2
Tests at 240 Volts ac, high pf, starting at no initial load, 25C
Minimum test points plotted so variations should be plus

EEI-NEMA TYPE K-TIN

February 1970
MAXIMUM CLEARING TCC

Curves of M-E fuse links in M-E cutouts • Basis for data: NEMA Standard SG2
Tests at rated-cutout Volts ac, low pf, starting at no initial load, 26C
Maximum test points plotted so variations should be minus

EEI-NEMA TYPE K-TIN

R2440.9
25-Amp Coil—
Recloser Clearing Time

Curve A: Maximum clearing time
for one operation, variations negative.
Curves B, C, and D: Average clearing time
for one operation, variations ±10%.
Tests conducted at 25°C.