EE 4223/5223 - Lecture 28

Mon Mar 21, 2011

Ongoing List of Topics:

- URL: http://www.ece.mtu.edu/faculty/bamork/EE5223/index.htm
- Term Project - a few proj/teams just getting moving.
  - Follow timeline, see posting on web page
  -
- Next homework set topics:
  - Probs 4.2, 4.3 (a,b,c), 4.4
  - Transformer differential relay application
- Protection fundamentals for 87T, cont’d –
  - a) correct connection of CT secondaries to relays (Lecture 24)
  - b) relay settings, to compensate for pri voltage ratio and CT ratios.
  - c) Mismatch problems - due to being forced to use less than full CT ratio, and having Pri and Sec CTs with different accuracy levels. Differential slope of trip characteristic can be 10%, 15%, 25%, etc, to allow for mismatch. Refer to XFRM.pdf!
- Transformer damage curves –
- Inrush types: 1) energization; 2) recovery; 3) sympathetic. §9.3.
- LTC, PS (Adjustable Turns Ratio, TTR)
- △'s, Y's, phase shifts
- CT Secondary Connections (G1, G2)
- Internal Settings - Phase Shift (G3)
G1 Relay

Total MMFs

\( I_{R1} N_1 + I_{R2} N_2 \)
should add
to approx zero
to avoid relay operation.

*Note*: tap

Setting determines values of \( N_1 \) & \( N_2 \).

(Ampere's Law: \( NI = R\Phi \))
Mismatch - Thru - Currents

- CT ratios
- Tap settings

\[ H \wedge \wedge 87T \]

\[ R_1 \quad R_2 \]

\[ I_{e1} \quad I_{e2} \quad I_{r1} \quad I_{r2} \]
Figure 13. HU, HU-1 and HU-4 Differential Characteristics (30% Sensitivity).
Figure 14. HU, HU-1 and HU-4 Differential Characteristics (35% Sensitivity).
Ideally: for G3 relay, just connect line currents & provide settings.