

Elect

College of Engineering, Pune.
T.Y.B.Tech (Electrical)
End Semester Exam(May 2013)
Switchgear and Protection

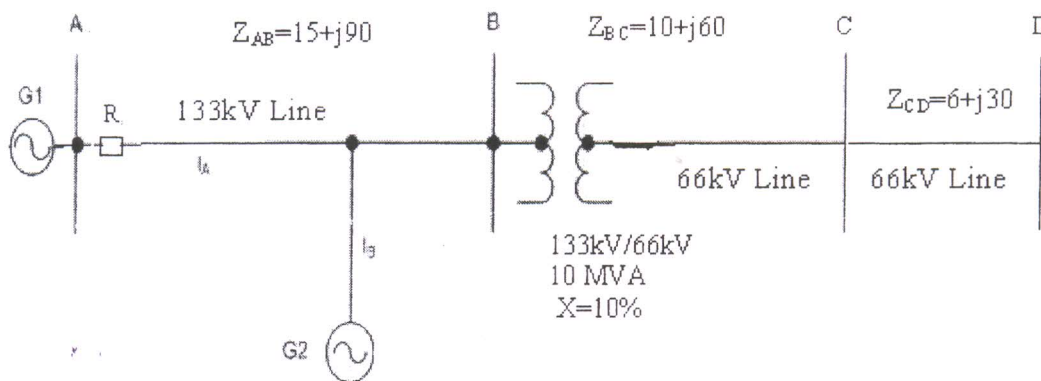
Time: Three Hours

Maximum marks: 50

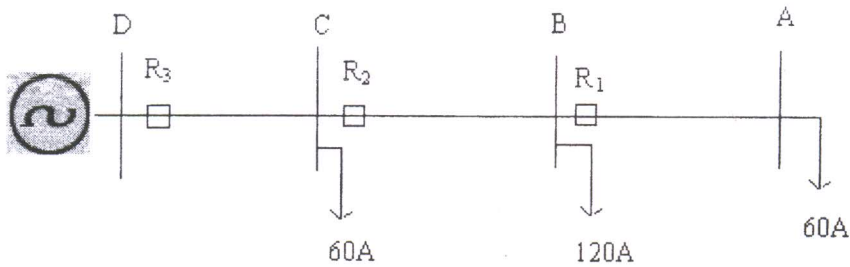
Instructions to candidates:

- 1) Neat Diagrams must be drawn wherever necessary.
- 2) Assume suitable data, if necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of only nonprogrammable calculators is allowed.
- 5) Start answers of each question on new page.

- Q,1a) Explain with neat diagrams and relevant mathematical equations, how the CT saturation problems are handled by the high impedance bus bar differential protection scheme. (5)
- Q,1b) If a 400:5 class 'C' CT is connected to a meter with resistance of 0.8 ohms and secondary current in CT is 4.8 A. Find the primary current, voltage developed across the meter and % Ratio error. Lead wire resistance is 0.05 ohms. Refer standard CT curves.
What is C.T. over sizing factor? (3)
- Q,2 For the figure shown, obtain the three zone settings for a three stepped distance protection of a transmission line using a simple impedance relay if the out feed current I_B is equal to half of the current I_A and generator G2 is located at a distance of 60 percent of line length AB from bus A. C.T. ratio is 300:1 amp and P.T. ratio 133000/110 volts. A 10 MVA, 133kV/66kV, X=10% transformer is placed at bus B as shown in the figure. (9)



Q,3 For the radial distribution system shown in the diagram, coordinate the IDMT over current relays R_1 , R_2 and R_3 using the data in Table 1. Use IEC standard inverse characteristics. (9)



Feeder segment	Minimum Fault current (A)	Maximum Fault current (A)
AB	300	600
BC	700	1300
CD	1200	2200

Table 1: Maximum and minimum fault currents in the feeder segments

Q,4 A three phase, 5 MVA, delta star connected power transformer has a voltage ratio of 133 kV/33 kV. The C.T. ratio on 33kV side is 400:5. A differential protection scheme is employed. What should be the C.T. ratio on the H.V. side, so that the scheme will operate correctly? (4)

Q,5a) Compare various phasor estimation algorithms. Explain the concept of mimic impedance with relevant equations. What is its role? (5)

Q,5b) Explain with relevant mathematical equations why is residual current compensation required in case of single line to ground fault distance measuring unit? (5)

Q,6a) What are the effects of loss of prime mover of the alternator? How is the protection provided against it? (5)

Q,6b) Explain with suitable diagrams, what is aliasing. If a 40 KHz signal is sampled at 37 KHz, what is the minimum frequency to which this signal is aliased and why? Draw a block diagram of a numerical relay and explain. Compare a numerical relay with a conventional relay. (5)

OR

Q,6b) Write short notes on: (5)

i. ZnO type lightning arrester

ii. Substation grounding

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Best of luck!