

M.E. Electrical Engineering (Power System)  
Second Semester  
EE-8210: Fast Transients in Power Systems

Time allowed: 3 Hours

Max. Marks: 50

**NOTE:** Attempt any five questions. Missing data (if any) can be appropriately assumed.  
x-x-x

- 1.A) What is the importance of Bewley's Lattice diagram? (02)
- B) Define the abnormal switching transients. (02)
- C) List out the frequency ranges of the various transients in power system. (02)
- D) What do you mean by ferroresonance? (02)
- E) Explain the selection procedure of lightning arrester. (02)
- 2.A) What is tower footing resistance? Why is it required to have this resistance as low as economically possible? What are the methods to reduce this resistance? (05)
- B) Define lightning phenomenon. Explain the mechanism of lightning strokes and its characteristics. (05)
- 3.A) What is called capacitance switching? With necessary sketches, explain the capacitance switching with a restrike and multiple restrike. (05)
- B) Explain briefly about attenuation and distortion of electromagnetic waves. (05)
- 4.A) Explain the travelling wave phenomenon in multi conductor system. (05)
- B) For a 750 kV line, take  $V_w = 3000$  kV, crest, travelling on the line and  $V_p = 1700$  kV. The line surge impedance is  $Z = 300$  ohms. Calculate and discuss (05)
- (a) the current flowing in the line before reaching the arrester,
- (b) the current through the arrester, and
- (c) the value of arrester resistance for this condition and verify the reflection and refraction coefficients giving rise to the voltage and current conditions.
5. An inductance of  $800 \mu\text{H}$  connects two sections of a transmission line each having a surge impedance of 350 ohms. A 500 kV  $2\mu\text{s}$  rectangular surge travels along the line towards the inductance. Determine the maximum value of the transmitted wave. (10)

P.T.O.

(2)

6. Draw and explain a small power system model considering rotating machines, transformers, transmission lines and cables for transient studies. (10)
- 7.A) What is meant by insulation coordination? How are the protective devices chosen for optimal insulation level in a power system? (05)
- B) What is a Gas insulated substation? Discuss its advantages and disadvantages as compared to the conventional air insulated substation. (05)
8. Write short notes on the following:
- A) line dropping and load rejection. (05)
- B) causes of over voltages due to various faults occurring in power system (05)

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