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Reg. No. :

Question Paper Code : 23413

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Eighth Semester

Electrical and Electronics Engineering

EE 1003/ EE 1005 — POWER SYSTEMS TRANSIENTS

(Regulation 2004/2007)

(Common to B.E. (Part–Time) Seventh Semester, Electrical and Electronics Engineering, Regulation 2005)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Name the different sources of transients in power system.

2. Draw the equivalent circuit of resistance switching problem.

3. Define current chopping.

4. State: Lightning stroke.

5. What are the interaction between lightning and the power system?

6. Mention some of the factors to be considered while designing a transmission line in view of lightning stroke.

7. Draw the electric and magnetic field lines of a current carrying single phase transmission system.

8. What are the advantages of Bewely's lattice diagram?

9. Define surge impedance.

10. Write some of the transient studies that can be performed using EMTP software.

PART B — (5 × 16 = 80 marks)

11. (a) Derive the three solutions of the inductor current of a parallel RLC circuit when the charge on the capacitor is discharged through the other two branches.

Or

(b) Discuss in detail the generation of transients due to load switching with a diagram of equivalent circuit and transient voltage across load and switch.

12. (a) A 13.8KV, 50Hz, single phase transformer takes a current of 2.8A rms (assumed sinusoidal) at a power factor of 0.15 when energized on no-load at its rated voltage. When disconnecting the transformer under these conditions, a circuit breaker chops 2A. Calculate the peak of the voltage transients that ensues due to the chop. The effective winding capacitance is 2.5×10^{-9} Farad.

Or

(b) Illustrate the problem of capacitance switching with the effect of source regulation.

13. (a) Explain the physical phenomenon of lightning with a generalized diagram showing air currents and distribution of electricity.

Or

(b) Discuss and derive the distributed and lumped parameter equivalent circuit representation for lightning stroke to transmission tower.

14. (a) Derive the travelling wave equation and its corresponding voltage solution of a single phase transmission system.

Or

(b) Write short notes on

(i) Behaviour of travelling waves at line terminations. (8)

(ii) Lattice diagram for a single transmission line terminated with an impedance. (8)

15. (a) A surge travelling along an overhead line is approaching a junction with an underground cable. The characteristics of the line and cable are as follows.

Overhead line	1.208 μH/m	9.32pF/m
Cable	0.201 μH/m	196.2pF/m.

The surge can be $V(t) = 800e^{25000t}$. Determine the voltage 5km from the line/cable on the line side, and the current 2km from the line/cable side, 25 μs after the surge reaches the junction.

Or

(b) Write short notes on

(i) Distribution of voltage on a faulted system. (8)

(ii) EMTP for transient computation. (8)