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**Exam.Code:1018**
**Sub. Code: 7791**

**1108**

# M.E. Electrical Engineering (Power Systems)
## Second Semester
## EE-8207: Fast Transients on Power Systems

**Time allowed: 3 Hours** **Max. Marks: 50**

*NOTE: Attempt <u>any five</u> questions. Missing data (if any) can be appropriately assumed.*

x-x-x

Q1. A) Draw the electro-geometric model of the lightning strike and explain it in detail. (05)

B) Explain in detail the protection schemes used for the protection of the generating station and substation against the direct lightning strokes. (05)

Q2. A) Derive the reflection and refraction coefficients of a travelling wave. (05)

B) Construct a multi conductor system and discuss the attenuation and distortion with necessary equations. (05)

Q3. A) Explain the Bewley's lattice diagrams with examples. (05)

B) Explain the behavior of travelling waves at line terminations for (i) open circuited line (ii) short circuited line. (05)

Q4. A) Describe briefly about characteristics of Ferro resonance. (05)

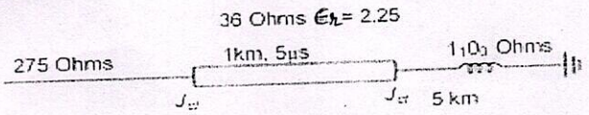
B) What is called capacitor switching? With necessary sketches, explain capacitive switching with a strike and multiple restrike. (05)

Q5. A) Explain the line drooping and load rejection in integrated power system. (05)

B) Explain the voltage transients on closing and reclosing of lines and switching surges on integrated system. (05)

Q6. A 400KV horizontal line has 22 discs in the insulator and two ground wires spaced 15 meters apart at 20 m height at mid span and 26 m at the tower. The tower footing resistance is 40 Ω. The surge impedances are Ground wire: 500 Ω, stroke: 400 Ω. Assume 60% of strokes to contact within ¼ span of line from the tower and at the tower top. The coupling factor between ground and phase conductor is 0.2 and the factor in Ns is 0.2. The isokeraunik level is 60 thunderstorm days per year. Calculate the number of trip-outs per year per 100 KM of line. (10)

Q7. A) A 750 KV transmission line has a surge impedance of 275 Ω and the transformer to be connected to it has a surge impedance of 1100 Ω for its h.v. winding. The length of winding is 50Km and its far end is connected to a zero resistance ground. A surge of 2400 kV is coming in the line which is to be limited to 725 kV at the transformer bushing by using a short cable. (i) Calculate the surge impedance and voltage rating of the cable to be interposed between line and transformer. (ii) Calculate the voltage at h.v. terminal of the winding as soon as the first reflection arrives from the grounded end. (05)




B) Explain the characteristics of protective devices? How the arresters are located in insulation co-ordination? (05)

Q8. A) Consider a suitable system having transmission lines, cables, transformer, and two rotating machines. Demonstrate the modeling of power apparatus for transient studies. (05)

B) Write a short note on the principle on the digital computation of power system transients. (05)

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