

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2113

Roll No.

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**B.Tech.**

(SEM. V) ODD SEMESTER THEORY

EXAMINATION 2013-14

**ELEMENTS OF POWER SYSTEM**

*Time : 3 Hours*

*Total Marks : 100*

**Note :-** (1) Attempt all questions.

(2) All questions carry equal marks.

1. Attempt any **four** parts of the following: **(5×4=20)**
  - (a) Explain the advantages of HVDC transmission over EHVAC transmission.
  - (b) A 50 km long transmission line supplies a load of 5 MVA at 0.8 power factor lagging at 33 kV. The efficiency of transmission is 90 percent. Calculate the volume of conductor aluminium required for the line when single phase, 2-wire system is used.
  - (c) Explain different types of conductors in power system.
  - (d) Explain Kelvin's Economy Law and derive the condition for most economical cross-sectional area of the conductor.
  - (e) Explain skin effect and proximity effect.
  - (f) Draw and explain single line diagram of power system.

2. Attempt any **two** parts of the following : (10×2=20)

(a) Deduce an expression for the total inductance of a single phase line.

(b) A three phase 50 Hz transmission line consists of three equal conductors of radii  $r$ , placed in a horizontal plane, with a spacing of 6 m between the middle and each outer conductors. Determine the inductive reactance per phase per km of the transposed line if the radius of each conductor is 12.5 mm.

(c) What is the effect of earth on line capacitance ? Explain the method of images to calculate the capacitance of two wire single phase line.

3. Attempt any **two** parts of the following : (10×2=20)

(a) Derive A, B, C and D parameters for Nominal  $\pi$  model of a medium line and draw its phasor diagram.

(b) Explain the phenomenon of corona and factors affecting corona.

(c) A string of suspension insulators consists of four units. The capacitance between each link pin and earth is one tenth of the self capacitance of a unit. The voltage between the line conductor and earth is 100 kV. Find :

(i) the voltage distribution across each unit and

(ii) string efficiency.

4. Attempt any **two** parts of the following : **(10×2=20)**
- (a) Explain catenary method for the calculation of sag and tension in transmission line.
  - (b) A transmission line conductor at a river crossing is supported from two towers at heights of 30 m and 90 m above water level. The horizontal distance between the towers is 270 m. If the tension in the conductor is 1800 kgf and the conductor weighs 1.0 kgf per meter find the clearance between the conductor and the water at a point midway between the towers. Assume parabolic configuration.
  - (c) Explain capacitance grading of the cables used in power system.
5. Attempt any **two** parts of the following : **(10×2=20)**
- (a) Derive the condition for most economical size of cable using voltage gradient method. The test results for 1 km of a three-phase metal sheathed belted cable gave a measured capacitance of 0.7  $\mu\text{F}$  between one conductor and the other two conductors bunched together with the earth sheath and 1.2  $\mu\text{F}$  measured between the three bunched conductors and the sheath. Find :
    - (i) the capacitance between any pair of conductors, the sheath being isolated and
    - (ii) the charging current when the cable is connected to 11 kV, 50 Hz supply.
  - (b) Explain advantage of Neutral grounding and Peterson Coil grounding.
  - (c) Explain the phenomena of Neutral grounding by grounding transformer.