

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

**PAPER ID : 2113**

Roll No.

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**B. Tech**

**(SEMESTER-V) THEORY EXAMINATION, 2012-13**

**ELEMENTS OF POWER SYSTEM**

*Time : 3 Hours ]*

*[ Total Marks : 100*

*Note : Attempt all questions.*

**Section – A**

1. Answer all parts of this section :

**10 × 2 = 20**

- (a) Explain “Kelvin’s Law”.
- (b) State and explain “FERRANTI EFFECTS”.
- (c) What are the advantages and disadvantages of “CORONA” formation in power system ?
- (d) Explain “CORONA loss”.
- (e) Explain the utilities of “BUNDLE CONDUCTORS” in power system.
- (f) What are the kinds of D.C. links used HVDC ?
- (g) Give the single line diagram of a power system.
- (h) Explain the “SURGE IMPEDANCE LOADING” in power system.
- (i) State and explain proximity effect and skin effect in power system networks.
- (j) What do you mean by “DIELECTRIC LOSS” in cables ? Write its expressions.

## Section – B

2. Answer any **three** parts of the following :

**3 × 10 = 30**

- (a) Find the critical disruptive voltage and the critical voltages for local and general corona on a 3- $\phi$  overhead transmission line, consisting of three standard copper conductors spaced 2.5 m apart at the corners of an equilateral triangle. Air temperature and pressure are 21 °C and 73.6 cm Hg respectively. The conductor dia, irregularity factor and surface factors are 10.4 mm, 0.85, 0.7 and 0.8 respectively.
- (b) What are the basic needs of HVDC transmission over EHV AC ? Also discuss the advantages and disadvantages of HVDC transmission systems. What are the limitations of EHV AC transmission systems ?
- (c) What do you mean by “STRING EFFICIENCY” in insulators ? Also mention its importance and limitations.
- (d) An overhead line having a conductor of dia 10 mm and a span length of 150 metres has a sag of 3.5 metres at  $-5$  °C with 10 mm thick ice coating and a wind pressure of 40 kg/m<sup>2</sup> of projected area.  $E = 1.27 \times 10^6$  kg/cm<sup>2</sup>,  $\alpha = 16.6 \times 10^{-6}/^{\circ}\text{C}$ , ice density 910 kg/m<sup>3</sup>, copper density 8850 kg/m<sup>3</sup>. Determine the temperature at which the sag will remain the same under fair weather conditions.
- (e) A string of six insulator units has mutual capacitance 10 times the capacitance to ground. Determine the voltage across each unit as a fraction of the operating voltage. Also determine the string efficiency.

## Section – C

Answer **all** questions.

**5 × 10 = 50**

3. Explain the following :

- (i) Methods of equalizing the potential in overhead line insulators.
- (ii) Types of insulators and their applications.

**OR**

Explain how you obtain A, B, C & D parameters of a model of a long transmission line in the laboratory.



4. Determine the voltage at the generating station and the efficiency of transmission for the following 1- $\phi$  system as shown in fig. 1.

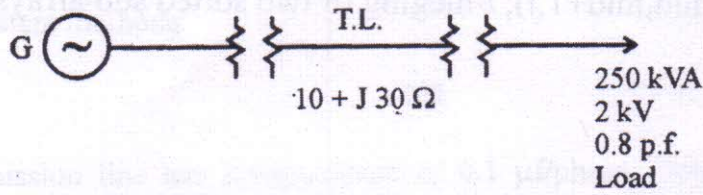


Fig. 1 1- $\phi$  System

Transformer ratio 2 kV/11kV. The resistance on l.v. side =  $0.04 \Omega$  and h.v. side =  $1.3 \Omega$ . Reactance on l.v. and h.v. side are  $0.125 \Omega$  and  $4.5 \Omega$ .

OR

Determine the inductance of the double circuit line shown in fig. 2. The self GMD of the conductor is 0.0069 metre.

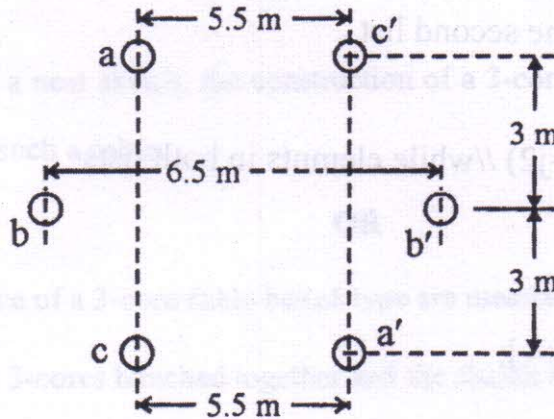


Fig. 2 Double Circuit Line

5. What do you mean by "Electrostatic" and "Electromagnetic interference" with communication lines in power system ? Also mention their advantages and disadvantages.

OR

What are the methods of reducing "CORONA" and "INTERFERENCE" in power systems ? Also mention the factors affecting the corona formations.

6. What do you understand by "NEUTRAL GROUNDING" ? Also mention its advantages and disadvantages. Discuss the various methods of neutral grounding in power system methods.

OR

A transmission line has a capacitance of  $0.1 \mu\text{f}/\text{phase}$ . Determine the inductance of PETERSON'S coil to neutralize the effect of capacitance of

- (i) complete length of line
- (ii) 97% of the line
- (iii) 90% of length of the line

The supply frequency is 50 Hz

7. Describe with a neat sketch, the construction of a 3-core belted type cable. Discuss the limitations of such a cable.

OR

The capacitance of a 3-core cable belted type are measured and found to be as follows :

- (i) between 3-cores bunched together and the sheath  $8 \mu\text{f}$ .
- (ii) between conductor and the other two connected together to the sheath  $5 \mu\text{f}$ .

Calculate the capacitance to neutral and the total charging kVA. When the cable is connected to a 11 kV, 50 Hz, 3- $\phi$  supply.