



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

PAPER ID : 121403

Roll No.

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B. Tech.

(SEM. IV) THEORY EXAMINATION, 2014-15
ELEMENTS OF POWER SYSTEM

Time : 3 Hours]

[Total Marks : 100

Note : Attempt all questions. All questions carry equal marks.

1 Attempt **any four** parts of the following : **4×5=20**

- (1) Compare the volume of conductor required for 3 phase, 3 wire systems and DC 3 wire system where third wire is neutral and supposed to carry the current when one pole is out.
- (2) Show that at higher voltage and at higher power factor, the efficiency of transmission will increase. What is the limiting factor of high voltage transmission line?
- (3) Explain why the voltage drop is of primary concern in the design of the distributors.
- (4) Discuss the advantages of using overhead lines compared to underground cables.
- (5) What do you understand by single line diagram of a power system? What is the need of this diagram?

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

- (1) Find the capacitance per phase of symmetrically spaced double circuit, 3 phase lines.
- (2) Prove that of conductors of the 3 phase transmission line yields equal inductance per phase.
- (3) Explain skin effect and proximity effect in reference to over head lines.

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

- (1) Determine the critical disruptive voltage and corona loss for a 3 phase line operating at 110 kV which has conductor of 1.25 cm diameter arranged in a 3.05 m delta. Assume air density factor of 1.07 and dielectric strength of air to be 21 kV/cm.
- (2) A string of 6 insulator units has mutual capacitance 10 times of capacitance to ground. Determine the voltage across each unit as a fraction of the operating voltage. Also determines the string efficiency.
- (3) Derive the expression for critical disruptive voltage of air. Show that for a given distance d between two lines, the radius of the conductor when maximum critical disruptive voltage occurs is d/e .

4 Attempt **any two** parts of the following : **2×10=20**

- (1) An overhead line has the following data span length 150 m, conductor diameter 0.95 cm, weight per unit length of the conductor 0.65 kg/m. Ultimate stress 4250 kg/cm², wind pressure 40 kg/m² of projected area. Factor of safety 5. Calculate the sag.
- (2) Classify cables according to voltage, location of use, no. of cores and types of insulation.
- (3) What do understand by vibration dampers in overhead transmission line? Describe the different types of dampers used.

5 Attempt **any two** parts of the following : **2×10=20**

- (1) Gives a comparison between solid grounding and resistance grounding of power system neutrals.
- (2) A 132 kV, 3-phase, 50 Hz transmission line 190 km long consist of 3 conductor of effective diameter 20 mm arranged in a vertical plane with 4 m spacing and regularly transposed. Find the inductance and kVA rating of the arc suppressor coil.
- (3) What are the main limitations of HVAC transmission system? How does FACTS device useful for these?