Question Paper Code : 71508

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fifth Semester

Electrical and Electronics Engineering

EE 2303/EE 53/10133 EE 506 — TRANSMISSION AND DISTRIBUTION

(Regulation 2008/2010)

(Common to PTEE 2303/10133 EE 506 — Transmission and Distribution for B.E. (Part-Time) Third Semester – Electrical and Electronics Engineering – Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the primary distribution voltages in India.

2. State the limitation of high transmission voltages.

3. What is meant by transposition in overhead transmission line?

4. What is skin effect? On what factors does it depend?

5. Draw the nominal T and π model of medium transmission line with its parameters filled.

6. What is meant by surge impedance and surge impedance loading of transmission line?

7. Define safety factor of insulator. Why it is desired to have this value be high?

8. State the limitations of solid type cables. How are these overcome in pressure cables?

9. State the advantages and disadvantages of having two circuit breakers in duplicate bus-bar system.

10. What is the purpose of inter-connector in a dc ring main distributor?

11. (a) (i) Show that to transmit same amount of power over same 3-phase transmission system, high transmission voltage reduces volume of conductor material. (6)

(ii) An overhead line has a span of 150 m between level supports. The conductor has a cross-sectional area of 2 cm^2. The ultimate strength is 5000 kg/cm^2 and safety factor is 5. The specific gravity of the material is 8.9 gm/cc. The wind pressure is 1.5 kg/m. Calculate the height of the conductor above the ground level at which it should be supported if a minimum clearance of 7 m is to be left between the ground and the conductor. (10)

Or

(b) (i) An overhead line spanning over a river is supported at two ends by towers of 45 m and 75 m. Find the clearance between the conductor and water at a point midway between towers. The tension is to be limited to 2500 kg. The weight of the conductor is 0.9 kg/m and the distance between the towers is 300 m. (10)

(ii) Discuss the advantages of DC transmission system over AC. (6)

12. (a) (i) Starting from fundamental derivation of flux linkages with conductor per phase, derive an expression for the inductance per phase for a 3-phase overhead transmission system when conductors are symmetrically placed. (10)

(ii) A 3-phase 80 km long transmission line has its conductors of 1.0 cm diameter spaced at the corners of the equilateral triangle of 100 cm side. Find the inductance per phase of the system. (6)

Or

(b) (i) If the double circuit 3-phase line as show in Fig. Q. 14 (a) has conductors of diameter 2.5 cm and distance of separation (D) is 2 m in the hexagonal spacing arrangement, calculate the phase-to-neutral capacitance in μF per 100 km of the line. (10)

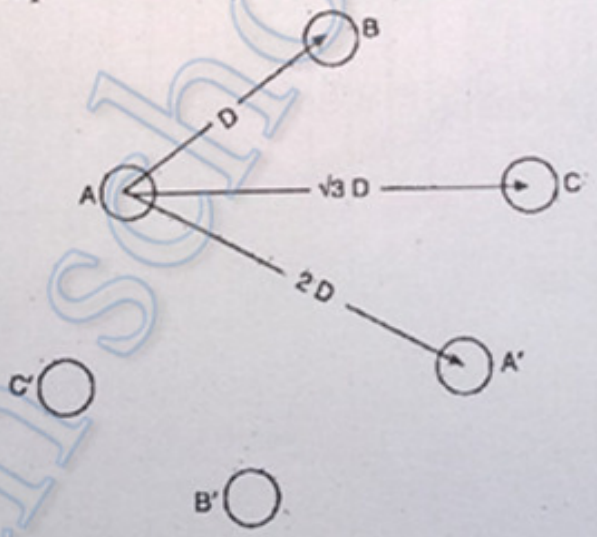

Fig. Q. 14 (a)

(ii) Explain the following terms with reference to corona : (6)

(1) Critical disruptive voltage and

(2) Visual critical voltage.

4×10^{-4} mho per phase. If the load at the receiving end is 50 MVA at 0.8 pf lagging with 132 kV line voltage, calculate (i) voltage and current at sending end (ii) regulation and (iii) efficiency of the line for this load. Use nominal π-method. (16)

Or

(b) (i) Explain Ferranti effect with relevant phasor diagram. (6)

(ii) What is power circle diagram? With necessary equation explain the construction of power circle diagram. (10)

14. (a) (i) Define string efficiency of suspension insulator string. List the methods to improve it. (4)

(ii) Each line of a 3-phase system is suspended by a string of 3 identical insulators of self-capacitance 'C' F. The shunt capacitance of connecting metal work of each insulator is 0.2 C to earth and 0.1 C to line. Calculate the string efficiency of the system if a guard ring increases the capacitance to the line of metal work of the lowest insulator to 0.3 C. (12)

Or

(b) (i) Describe the general construction of a 3-conductor cable with neat sketch. (6)

(ii) A single core cable for 66 kV, 3-phase system has a conductor of 2 cm diameter and sheath of inside diameter 5.3 cm. It is required to have two intersheaths so that the stress varies between the same maximum and minimum values in the three layers of dielectric. Find the positions of intersheaths, maximum and minimum stress and voltages on the intersheaths. Also find the maximum and minimum stress if the intersheath are not used. (10)

15. (a) (i) Write short notes on Resonant earthing. (6)

(ii) Describe the different types of bus-bar arrangements used in substation. Illustrate with suitable diagrams. (10)

Or

(b) Two consumers *A* and *B* draw 20 A and 10 A at unity pf respectively. The feeding point *S* is fed at 230 V single phase supply. From *S* the supply is taken to a point *C*, 500 m away from *S*. Distances *CA* and *CB* are 300 m and 200 m respectively. All the three cables are worked at the same current density. The maximum permissible voltage drop is 5 %. Find (i) cross sectional area of the cables and (ii) percentage power loss. Assume conductor resistivity = 0.032 ohm/m/mm^2. (16)
