Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 91445

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fifth Semester

Electrical and Electronics Engineering

EE 2303/EE 53/10133EE506 — TRANSMISSION AND DISTRIBUTION

(Regulation 2008/2010)

(Common to PTEE 2303/10133EE506 – 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. What are the factors on which conductor spacing and ground clearance depend?
2. State Kelvin's law for size of transmission conductor.
3. Give the advantages of bundled conductors.
4. Define Critical disruptive voltage.
5. What is meant by 'natural loading' of transmission lines?
6. Why the control of reactive power is essential for maintaining a desired voltage profile?
7. What are the factors to be considered while selecting a cable for a particular service?
8. Why are insulators used with overhead lines?
9. What is the purpose of terminal and through sub-stations in the power system?
10. How does a.c. distribution differ from d.c. distribution?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss in detail the problem associated with EHV AC transmission. Also state how these problems are being solved? (8)

(ii) What are the basic types of FACTS controllers? And explain. (8)

Or

(b) (i) A transmission line has a span of 275 metres between level supports. The conductor has an effective diameter of 1.96 cm and weighs 0.865 kg/m. Its ultimate strength is 8060 kg. If the conductor has ice coating of radial thickness 1.27 cm and is subjected to a wind pressure of $39\ kg/m^2$ of projected area, Calculate the maximum sag. Assume that the safety factor is 2 and ice weighs $910\ kg/m^3$. (10)

(ii) What is a sag-template? Explain how this is useful for location of towers and stringing of power conductors? (6)

12. (a) (i) Derive an expression for the flux linkages of one conductor in a group of n-conductors carrying currents whose sum is zero. Hence derive an expression for inductance of composite conductors of a single phase line consisting of m-strands in one conductors and n-strands in the other conductor. (10)

(ii) Explain the concept of self GMD and mutual GMD for evaluating inductance of transmission line. (6)

Or

(b) (i) Derive an expression for capacitance per phase for a three phase overhead line when the conductors are unsymmetrically placed but completely transposed. (8)

(ii) Determine the capacitance and charging current per unit length of the line when the arrangement of the conductor is shown in Fig.Q. 12b(ii). The line is completely transposed and diameter is 15 mm and operating voltage is 220 kV. (8)

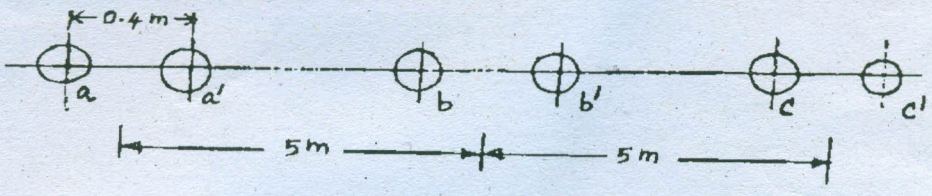

Fig.Q.12b (ii)

13. (a) (i) Explain the classification of transmission lines with their characteristics. (8)

(ii) Define the following:

(1) Surge impedance
(2) Attenuation constant
(3) Voltage regulation
(4) Transmission efficiency $(4 \times 2 = 8)$

Or

(b) A 3-phase overhead transmission line has a series impedance of (10 +j30) Ω per phase. For receiving and sending end voltages of 132kV and 140kV respectively. Draw the receiving end power circle diagram and determine the following:

(i) the maximum real power delivered by the line and the load power factor under that condition. (4)

(ii) The capacity of shunt compensation equipment for supplying a load of 150 MVA at 0.8 power factor lagging and the power angle under that condition. (4)

(iii) The capacity of shunt compensation equipment to maintain the above voltage under no-load condition. (4)

(iv) The unity power factor load that the line can supply with voltages at above values. (4)

14. (a) (i) Explain with neat sketches the constructional features of pin type and suspension type insulators. (8)

(ii) Each line of a 3-phase system is suspended by a string of three identical insulators of self-capacitance C farad. 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. (8)

Or

(b) Derive an expression for the insulation resistance, capacitance and the electrostatic stress of a single core cable. (16)

15. (a) What are the different types of bus-bar arrangements used in sub-stations? Illustrate your answer with suitable diagrams. (16)

Or

(b) Write short notes on the following:

(i) Ring main distributor (4)

(ii) Current distribution in a 3-wire d.c. system (4)

(iii) Balancers (4)

(iv) Three phase 4-wire a.c. distribution. (4)

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