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Question Paper Code : 51508

B.E/B. Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fifth Semester

Electrical and Electronics Engineering

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

(Regulations 2008/2010)

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

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Why HVDC line does not require any reactive power compensation ?
2. What are the factors affecting the sag in a transmission line ?
3. How inductance and capacitance of a transmission line are affected by the spacing between the conductors ?
4. What are composite conductors ?
5. Mention the range of surge impedance value for a overhead transmission line and a underground cable.
6. Draw equivalent circuit and phasor diagram for short transmission line.
7. What are the modern practices adopted to avoid grading of cables ?
8. Define string efficiency.
9. State the criteria on which the substation bus schemes are chosen.
10. What are the advantages of ring main distributors ?

Part – B (5 × 16 = 80 marks)

11. (a) (i) What is Flexible AC Transmission System (FACTS) ? Describe briefly various devices used in this system. **(8)**

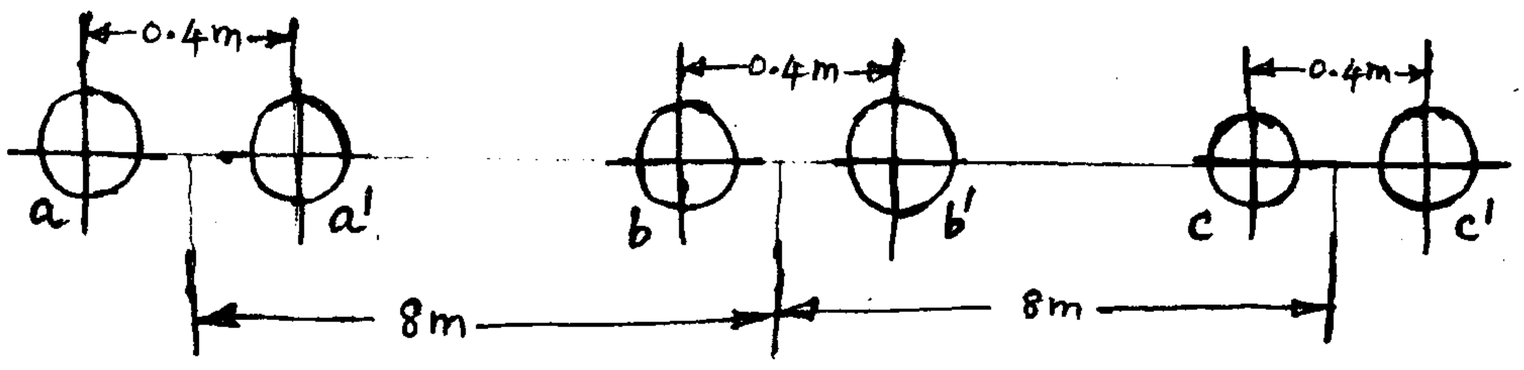
(ii) What is the effect of transmission voltage on line performance ? Derive mathematical expressions to validate the answer. **(8)**

OR

(b) (i) Derive an expression for the sag of a transmission line supported by towers of different heights at the ends. **(8)**

(ii) A transmission line conductor at a river crossing is supported from two towers at heights of 50 m and 80 m above water level. The horizontal distance between the towers is 300 meters. If the tension in the conductor is 2000 kg, find the clearance between the conductor and water level at a point midway between the towers. Weight of conductor per metre = 0.844 kg. Assume that the conductor takes the shape of parabolic curve. **(8)**

12. (a) A 460 kV bundled conductor transmission line has the conductor spacing as shown below. ACSR conductors are used. Determine the inductance per phase per km if the self GMD of each conductor is 0.9 cm. Assume line regularly transposed. **(16)**



OR

(b) (i) Explain the phenomenon of 'corona' at EHV line. How can the corona effect be minimized ? **(6)**

(ii) Determine (i) the critical disruptive voltage (ii) the visual critical voltage and (iii) the corona loss under foul weather condition for 3-phase line, 160 km long, conductor diameter 1.036 cm, 2.44 metre delta spacing. Air temperature 26.6 °C, corresponding to an approximate barometric pressure of 73.15 cm of mercury, operating voltage 110 kV at 50 Hz, surface irregularity factor is 0.85. Assume roughness factor is 0.72 and disruptive voltage under foul weather = 0.8 times of fair weather value. **(10)**

13. (a) (i) With reference to long transmission lines, give the physical interpretation of the following terms :

(1) characteristic impedance

(2) surge impedance

(3) surge impedance loading and

(4) propagation constant. **(8)**

(ii) Derive the ABCD constants of a medium transmission line with π-configuration. **(8)**

OR

(b) (i) Explain the step-by-step procedure for construction of receiving end power circle diagram. **(8)**

(ii) Derive the power flow performance equation of a three phase transmission line in the form of sending-end receiving-end complex power and voltages at the two ends of the line. **(8)**

14. (a) (i) Discuss how string efficiency is improved by capacitance grading in suspension insulators. **(8)**

(ii) A string of eight suspension insulators is to be graded to obtain uniform distribution of voltage across the string. If the capacitance of the top unit is 10 times the capacitance to ground of each unit, determine the capacitance of the remaining seven units. **(8)**

OR

(b) (i) Describe the general construction of an underground cable with a neat sketch. **(8)**

(ii) A single core cable used on 33 kV, 50 Hz has conductor diameter 10 mm and inner diameter of sheath 25 mm. The relative permittivity of insulating material used is 3.5. Find :

(1) capacitance of the cable per km

(2) maximum and minimum electrostatic stress in the cable

(3) Charging current per km. **(8)**

15. (a) Draw and explain the single line diagram, showing the location of substation equipments for the following bus bar arrangements :

(i) Single bus scheme

(ii) Single bus-bar with sectionalizing scheme

State the merits and demerits of each scheme. **(8 + 8)**

OR

(b) (i) Explain the reasons leading to the general practice of earthing the neutral point of a power system. Discuss the relative merits of earthing it (1) solidly and (2) through a resistance. **(10)**

(ii) Write short notes on 'earthing practises in a substation'. **(6)**