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

Question Paper Code : 50534

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Fourth Semester

Electrical and Electronics Engineering

EE 8402 – TRANSMISSION AND DISTRIBUTION

(Regulations 2017)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the effect of bundled conductors on line inductance?

2. What is proximity effect?

3. For a lossless transmission line $L = 0.001\,mH/m, C = 90pF/m$ and frequency = 50 Hz. Find the value of attenuation constant.

4. What are the factors which affect corona loss?

5. What is the effect of wind on sag?

6. What are the important factory tests conducted on insulators?

7. Define capacitance grading of cables.

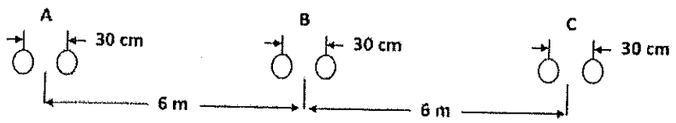
8. What are oil filled cables?

9. What is Kelvin's law for most economic size of the line conductor?

10. What is the role of the load power factor in the AC distribution system?

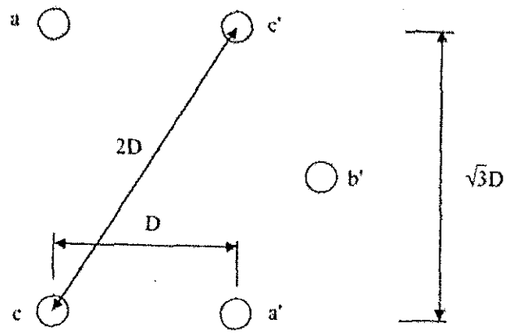
PART B — (5 × 13 = 65 marks)

11. (a) Calculate the inductance per km per phase for a 3-phase, 50 Hz, bundled conductor line shown in Figure. Each subconductor has a diameter of 25 mm and subconductor spacing is 0.3 m. Assume that each phase group shares total current and charge equally and the line is completely transposed.



Or

(b) A 3-phase double circuit line has the conductors at the vertices of a hexagon as shown in Figure. Find the formula for calculating capacitance per phase per km in terms of side D and conductor radius r.



12. (a) A 3-phase, 50 Hz, 16 km long overhead line supplies 1000 kW at 11kV, 0.8 p.f. lagging. The line resistance is 0.03 Ω per phase per km and line inductance is 0.7 mH per phase per km. Calculate the sending end voltage, voltage regulation and efficiency of transmission.

Or

(b) Draw the phasor diagram for a nominal π circuit and derive the expressions for sending end voltage and current in terms of receiving end voltage and current.

13. (a) An overhead line has a span of 336 m. The line is supported at a water crossing, from two towers whose heights are 33.6 m and 29 m above water level. The weight of conductor is 8.33 kg/m and tension in the conductor is not to exceed 33400 N. Find clearance between the lowest point on the conductor and water and also find the horizontal distance of this point from the lower support.

Or

(b) An insulator string for 66 kV line has 4 discs. The shunt capacitance between each joint and metal work is 10% of the capacitance of each disc. Find the voltage across the different discs and string efficiency.

14. (a) Draw the cross-section of a 3-core belted cable. Discuss the function of each part.

Or

(b) Derive a relation between the conductor radius and inside sheath radius of a single core cable so that the electric stress of the conductor surface may be minimum.

15. (a) Discuss about the different techniques of voltage control.

Or

(b) Discuss the technical and economic advantages of HVDC systems over HVAC systems.

PART C — (1 × 15 = 15 marks)

16. (a) A 3-phase overhead line has a series impedance of 10 + j30 ohms per phase. For receiving and sending end voltages of 132 kV and 140 kV respectively draw the receiving end power circle and determine the maximum real power which the line can supply and the load power factor for drawing this maximum power.

Or

(b) Two conductors of a DC distributor cable AB 1000m long have a total resistance of 0.1 Ω. The ends A and B are fed at 240 V. The cable is uniformly loaded at 0.5 A per metre length and has concentrated loads of 120 A, 60 A, 100 A and 40 A at points distant 200 m, 400 m, 700 m and 900 m respectively from the end A. Calculate the point of minimum potential and the value of minimum potential.

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