(b) A single phase distributor AB, one km long has resistance and reactance per conductor of 0.1 Ω and 0.15 Ω respectively. At the far end, the voltage $V_B = 200$ V and the current is 100 A at a p.f. of 0.8 lagging. At the mid-point M of the distributor, a current of 100 A is tapped at a p.f. of 0.6 lagging with reference to the voltage V_M at the mid-point.

Calculate :

(i) voltage at mid-point, V_M (7)

(ii) sending end voltage, V_A. (8)

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

Question Paper Code : 80132

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

Electrical and Electronics Engineering

EE 8402 — TRANSMISSION AND DISTRIBUTION

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the advantages of using bundled conductors?

2. List out the parameters affecting skin effect in transmission line.

3. What is the effect of leading load power factor on voltage regulation of a short transmission line?

4. What are the disadvantages of corona?

5. What are the types of line supports used in transmission and distribution systems?

6. What are the factors affecting the sag in a transmission line?

7. What are the desirable characteristics of insulating materials used in cables?

8. What are the sources of heat generation in an underground cable?

9. What are the limitations of Kelvin's law?

10. What are advantages of FACTS controllers?

PART B — (5 × 13 = 65 marks)

11. (a) Determine the inductance per km of a transposed double circuit 3-phase line shown in Figure 11(a) below. Each circuit of the line remains on its own side. The diameter of the conductor is 2.532 cm.

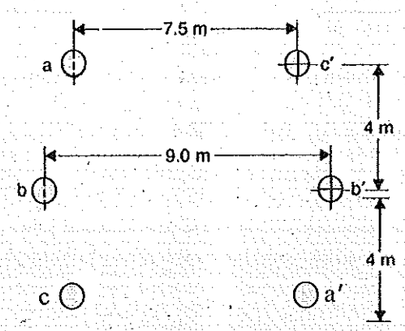

Figure 11(a)

Or

(b) A 3-phase, 50 Hz, 66 kV overhead line conductors are placed in a horizontal plane as shown in Figure 11(b) below. The conductor diameter is 1.25 cm. If the line length is 100 km, calculate :

(i) capacitance per phase,

(ii) charging current per phase, assuming complete transposition of the line.

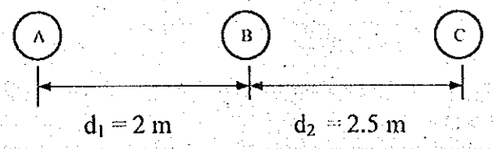

Figure 11(b)

12. (a) A 3-phase, 50 Hz transmission line 100 km long delivers 20 MW at 0.9 pf lagging and at 110 kV. The resistance and reactance of the line per phase per km are 0.2Ω and 0.4Ω respectively. The capacitive admittance is 2.5×10^{-6} siemen/km/phase. Calculate :

(i) the voltage at the sending end and

(ii) efficiency of transmission. Use nominal T method.

Or

(b) (i) A 275 kV transmission line has the following line constants:

$A = 0.85 \angle 5^\circ$ and $B = 200 \angle 75^\circ$

Determine the power at unity power factor that can be received if the voltage profile at each end is to be maintained at 275 kV. (7)

(ii) Discuss the factors affecting corona. (6)

13. (a) The towers of height 30 m and 90 m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 500 m. If the tension in the conductor is 1600 kg, find the minimum clearance of the conductor and water and clearance mid-way between the supports. Weight of conductor is 1.5 kg/m. Bases of the towers can he considered to be at water level.

Or

(b) Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5 kV, calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is 1/8th of the capacitance of the insulator itself Also find the string efficiency.

14. (a) A conductor of 1 cm diameter passes centrally through a porcelain cylinder of internal diameter 2 cm and external diameter 7 cm. The cylinder is surrounded by a tightly fitting metal sheath. The permittivity of porcelain is 5 and the peak voltage gradient in air must not exceed 34 kV/cm. Determine the maximum safe working voltage.

Or

(b) (i) A single-core cable has a conductor diameter of 1cm and insulation thickness of 0.4 cm. If the specific resistance of insulation is 5×10^{14} Ω-cm, calculate the insulation resistance for a 2 km length of the cable. (5)

(ii) What is meant by grading of cables? Explain any one method of grading. (8)

15. (a) What is a transformer sub-station? Discuss the role of major components in a transformer sub-station.

Or

(b) (i) What is neutral grounding? What are the advantages of neutral grounding? (6)

(ii) Explain the resistance grounding of the neutral point of a 3-phase system. (7)

PART C — (1 × 15 = 15 marks)

16. (a) A 2-wire d.c. ring distributor is 300 m long and is fed at 240 V at point A. At point B, 150 m from A, a load of 120 A is taken and at C, 100 m in the opposite direction, a load of 80 A is taken. If the resistance per 100 m of single conductor is 0.03 Ω. find :

(i) current in each section of distributor

(ii) voltage at points B and C. (8+7)

Or