Reg. No. :

Question Paper Code : 90200

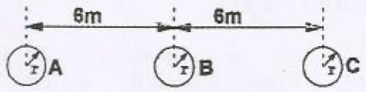
B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Fourth Semester
Electrical and Electronics Engineering
EE8402 – TRANSMISSION AND DISTRIBUTION
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

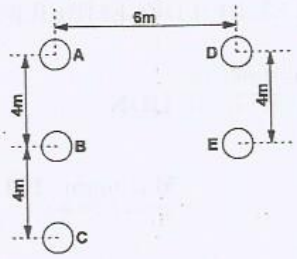
1. Explain briefly the skin and proximity effects.
2. A three phase 50 Hz transmission line consists of three equal conductors of radii 'r', placed in a horizontal plane, with spacing of 6 m between the middle and each of the outer conductors as shown in the figure. Determine the inductive reactance per phase per km of the transposed line if the radius of each conductor is 12.5 mm.



3. Explain about the physical interpretation of the long transmission line equations.
4. What is meant by characteristic impedance of a transmission line ?
5. What is string efficiency in a string of suspension type insulators ?
6. What are the main components of overhead transmission lines ?
7. What are the limitations of solid type cables ?
8. Calculate the capacitance and charging current of a single core cable used on a three phase, 66 kV system. The cable is 1 km long having a core diameter of 10 cm and an impregnated paper insulation of thickness 7 cm. The relative permittivity of the insulation may be taken as 4 and the supply at a frequency of 50 Hz.
9. Discuss the importance of voltage control in power systems.
10. What do you understand by induction regulators ?

PART – B (5×13=65 Marks)

11. a) A multi conductor single phase line has three conductors A, B and C each of diameter 40 mm for lead and two conductors, D and E of diameter 80 mm for return circuit as shown in the figure. Find the inductance per unit length on each side of the line and the total inductance of the line. (13)



(OR)

b) i) Derive the expression for line to line capacitance of a single phase two wire line and also find the capacitive reactance between one conductor to neutral. (7)

ii) A two-conductor single phase line operates at 50 Hz. The diameter of each conductor is 2 cm and are spaced 3 m apart, calculate : (6)

i) The capacitance of each conductor to neutral per km.

ii) Line to line capacitance.

iii) Capacitive susceptance to neutral per km.

12. a) A three-phase overhead line of length 8 km supplies 15000 kVA at 33 kV, 0.85 power factor lagging at the receiving end. Each line has R = 0.29 Ω per km and X = 0.65 Ω per km. Calculate

i) The voltage at the sending end,

ii) Power factor at the sending end,

iii) The regulation and

iv) The efficiency of the transmission line. (13)

(OR)

b) Explain the following : (13)

i) Theory of corona formation

ii) Factors affecting corona

iii) Disruptive critical voltage

iv) Visual critical voltage

v) Corona power loss.

13. a) i) In a 33 kV overhead line, there are three units in a string of insulators. If the capacitance between each insulator pin and earth is 11% of the self-capacitance of each insulator, find **(7)**

i) Distribution of voltage over three insulators and

ii) String efficiency.

ii) List and explain in brief about the various methods of improving string efficiency. **(6)**

(OR)

b) A transmission line has a span of 275 m 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/m. If the conductor has an ice coating of radial thickness 1.27 cm and is subjected to wind pressure of 3.9 gm/cm^2 of projected area, calculate Sag for a safety factor of 2. Weight of ice is 0.91 gm/cm^3. **(13)**

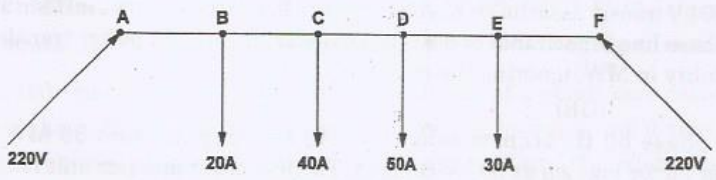
14. a) i) What is meant by grading of underground power cables ? List different classification of cables based on voltage level. **(6)**

ii) A single core, lead sheathed cable has a conductor of 10 mm diameter and two layers of different insulating materials each of 10 mm thick. The relative permittivities are 3 (inner) and 2.5 (outer). Calculate the potential gradient at the surface of the conductor when the potential difference between the conductor and the lead sheathing is 60 kV. **(7)**

(OR)

b) Explain how to measure the capacitance of single core and three core belted cables with neat diagram. **(13)**

15. a) A two wire street mains AF, 600 m long is fed from both ends at 220 V. Loads of 20 A, 40 A, 50 A and 30 A are tapped at distances of 100 m, 250 m, 400 m and 500 m from end A respectively. If the area of cross section of the distributor conductor is 1 cm^2. Find the voltage at point E. Take conductivity = 1.7×10^{-6} Ωcm. **(13)**

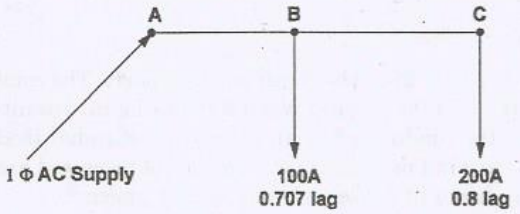


(OR)

b) i) A single-phase A.C. distributor AB of 300 m long is fed from end A and is loaded as under :

100 A at 0.707 power factor lag 200 m from point A.

200 A at 0.8 power factor lag 300 m from point A. **(9)**



The load resistance and reactance of the distributor are 0.2 Ω and 0.1 Ω per km respectively. Calculate the total voltage drop in the distributor.

ii) List the various methods of voltage control in power distribution systems. **(4)**

PART – C **(1×15=15 Marks)**

16. a) i) A fluorescent lamp takes a current of 0.75 A when connected across a 240 V, 50 Hz AC supply. The power consumed by the lamp is 80 W. Calculate the value of the capacitance to be connected in parallel with the lamp to improve the power factor to a) unity and to b) 0.95 lagging. **(5)**

ii) The generalized circuit constants of a 3 phase, 220 kV rated voltage, medium length transmission line are A = D = $0.97 \angle 0.6°$, B = $60 \angle 70°$ Ω, C = $0.001 \angle 91°$ S. Determine the magnitude of line to line sending end voltage of the transmission line if the load at the receiving end is 100 MW at 220 kV with a power factor of 0.8 lagging. **(5)**

iii) An 800 kV transmission line is having per phase line inductance of 1 mH/km and per phase line capacitance of 6.25 nF/km. What is its ideal power transfer capability in MW, ignoring the length of the line ? **(5)**

(OR)

b) A three phase 50 Hz transmission line, 40 km long delivers 36 MW at 0.8 power factor lagging at 60 kV (Phase). The line constants per unit length of the conductor are R = 2.5 Ω, L = 0.1 H, C = 0.25 µF. Shunt leakage may be neglected. Determine the voltage, current, power factor at the sending end. And also determine the efficiency and regulation of the line. Use nominal T method. **(15)**

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