Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 20977

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Fourth Semester

Electrical and Electronics Engineering

EE 3401 – TRANSMISSION AND DISTRIBUTION

(Regulations 2021)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Why the concept of self GMD is not applicable for capacitance calculation?

2. What is meant by skin effect?

3. Define Ferranti effect.

4. Write the formula for surge impedance of transmission line.

5. List the significance of a stringing chart.

6. Define String efficiency.

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

8. What is a belted-Cable?

9. What are the various types of HVDC systems?

10. What are advantages of FACTS controllers?

PART B — (5 × 13 = 65 marks)

11. (a) Derive an expression for loop inductance of a single phase transmission system.   (13)

Or

(b) Derive the expression for capacitance of three-phase transmission line with symmetrical and unsymmetrical spacing.   (13)

12. (a) A three phase 5km long transmission line, having resistance of $0.5\,\Omega$/km and inductance of 1.76 mH/km is delivering power at 0.8 pf lagging. The receiving end voltage is 32kV. If the supply end voltage is 33 kV, 50 Hz, find

   (i)   Line current   (5)

   (ii) Regulation   (4)

   (iii) Efficiency of the transmission line.   (4)

Or

   (b) Assume a three-phase line has the impedance of 5+j20 ohm per phase delivers a load of 30MW at a power factor of 0.8 lag and voltage of 33kV. Determine the capacity of the phase modifier to be installed at the receiving end if the voltage at sending end is to be maintained at 33kV. Assume the shunt admittance is neglected.   (13)

13. (a) A transmission line conductor is supported on the towers of equal height. The height of each tower is 30 m. The distance between the towers is 160 m, tension in the conductor is 2500 kg and cross sectional area of conductor is 2.5 cm². Compute the sag.   (13)

Or

   (b) In a 33 kV overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of self capacitance of each insulator, find the distribution of voltage over 3 insulators and string efficiency. Draw the equivalent circuit.   (13)

14. (a) Explain, the methods of grading of cables with neat diagrams and equations.   (13)

Or

   (b) Derive the expression for insulation resistance, capacitance, electric stress and dielectric loss of a single core cable.   (13)

15. (a) Explain, with a neat layout the modern EHV system. What is the highest voltage level available in India for EHV transmission?   (13)

Or

   (b) Find the ratio of volume of copper required to transmit the power over a given distance, by overhead system using,

   (i) DC 2 wire and 3 wire system,   (7)

   (ii) 3 phase, 3 wire AC system.   (6)

PART C — (1 × 15 = 15 marks)

16. (a) A uniform two wire DC distributor 250m long is loaded with 0.4 A/m and is fed at one end. If the maximum permissible voltage drop is not exceed 10V, find the cross sectional area of the distributor conductor. Take $\rho = 1.78 \times 10^{-8} \Omega m$. (15)

Or

(b) A 220 KV, 50 HZ, 200 Km long three phase line, has its conductors on the corners of a triangle with sides 6m, 6m and 12m. The conductor radius is 1.81 cm. Find the charging current, inductance and capacitance per phase per Km. (15)

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