Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 51010

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

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.   What is proximity effect?

2.   Distinguish between self and mutual GMD.

3.   Define the term critical disruptive voltage.

4.   What is Ferranti effect?

5.   What is the effect of insulators used in overhead lines?

6.   Give any two factors, that affect sag in an overhead line.

7.   What is the necessity of grading an underground cable?

8.   Classify the cables used for three phase service.

9.   What are the components of a power system?

10. Why high voltage is preferred for power transmission?

PART B — (5 × 13 = 65 marks)

11. (a)   Derive the expression for capacitance of a three – phase transmission line for symmetrical and asymmetrical spacing.

Or

     (b)   Derive the expression for inductance of a three – phase transmission line for symmetrical and asymmetrical spacing.

12. (a) Derive the expression for voltage regulation and transmission efficiency of a short transmission line.

Or

(b) Describe the importance of power circle diagram and explain the procedure to draw the power circle diagram at the receiving end.

13. (a) A transmission line has a span of 214 meters between level supports. The conductors have a cross-sectional area of 3.225 cm². Calculate the factor of safety under the following conditions :

Vertical sag = 2.35 m ; Wind pressure = 1.5 kg/m run

Breaking Stress = 2540 kg/cm²

Wt. of conductor = 1.125 kg/m

Or

(b) 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 be considered to be at water level.

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

The following are the two main methods of grading of cables:

(i) Capacitance grading (7)

(ii) Intersheath grading (6)

Or

(b) With neat diagrams, explain the constructional features of following types of cables.

(i) Belted cables. (5)

(ii) Screened cables (4)

(iii) Pressure cables (4)

15. (a) Explain the following types of FACTS controllers with necessary diagrams.

(i) Shunt controller (4)

(ii) Combined series - series controllers (4)

(iii) Combined series — shunt controller (5)

Or

2
51010

(b) Describe the following methods of voltage control with necessary diagrams.

    (i)   Tap changing transformers. (4)

    (ii)   Auto-transformer tap changing. (4)

    (iii) Booster transformer. (5)

PART C — (1 × 15 = 15 marks)

16. (a) A transmission line has a span of 150 m between level supports. The conductor has a cross-sectional area of 2cm². The tension in the conductor is 2000 kg. If the specific gravity of the conductor material is 9.9 gm/cm³ and wind pressure is 1.5 kg/m length, calculate the sag and vertical sag.

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
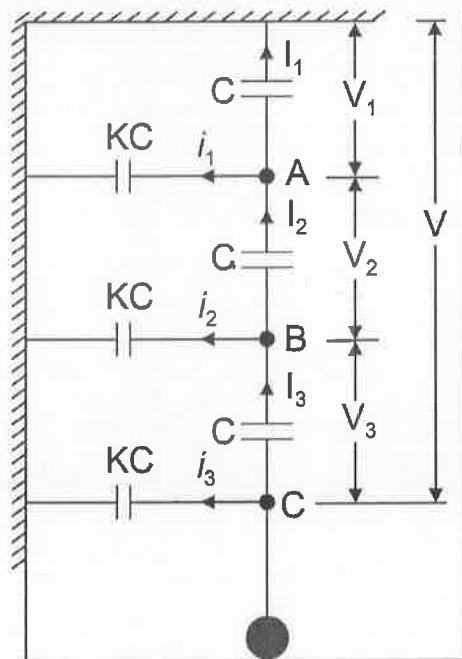
    (i)   distribution of voltage over 3 insulators (8)

    (ii)   string efficiency (7)