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Question Paper Code : 30150

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 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. Point out the advantages of bundled conductor.
2. Define proximity effect.
3. Write ABCD constants of medium T network.
4. Define Ferranti effect.
5. Give any two factors that affect sag in an overhead line.
6. What are the types of line supports used in transmission and distribution systems?
7. Compare overhead lines and underground cables.
8. Write the expression to determine capacitance of a single core cable.
9. How does AC distribution differ from DC distribution?
10. What are the advantages of FACTS controllers?

PART B — (5 × 13 = 65 marks)

11. (a) Derive the expression for inductance of three phase line with unsymmetrical spacing.

Or

- (b) A 220kV, 50Hz, 200km 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 capacitance per phase per km. Capacitive reactance per phase, Charging current and Charging Mega volt-amperes.
12. (a) Using rigorous method, derive expression for sending end voltage and current for a long transmission line.

Or

- (b) Explain various steps involved in receiving end power circle diagram with neat sketches.
13. (a) Derive an expression for sag of a line supported between two supports of the same height. Also Explain the effect of ice and wind loading.

Or

- (b) (i) Define string efficiency of suspension insulator string. List the methods to improve it. (5)
- (ii) Each line of 3 phase system is suspended by the string of 3 identical insulators of self-capacitance 'C' F. The shunt capacitance of connecting metal work of each insulator is 0.2 C to earth and 0.1 C to line. Calculate the string efficiency of the system if a guard ring increases the capacitance to the line of metal work of the lowest insulator to 0.3C. (8)
14. (a) With neat diagram, explain the various methods of grading of underground cables.

Or

- (b) Derive an expression for the insulation resistance, capacitance and the electrostatic stress of a single core cable.
15. (a) What are the different types of bus bar arrangements used in substations? Illustrate your answer with suitable diagrams.

Or

- (b) Discuss the advantages of HVDC transmission over HVAC transmission in detail.

PART C — ($1 \times 15 = 15$ marks)

16. (a) A cable is graded with three dielectrics of permittivity's 4, 3 and 2 respectively. The maximum permissible potential gradient is same and equals to 30kv/cm. The core diameter is 1.5cm and internal sheath diameter is 5.5cm. Calculate the working voltage.

Or

- (b) A 11kv 3 phase underground feeder, 2km long uses three single core cables. The diameter of each conductor is 28mm and an insulation thickness of 4.4 mm and the relative permittivity of 4. Determine
(i) Capacitance of the cable per phase (ii) charging current per phase
(iii) total charging KVAR (iv) Dielectric loss per phase if the power factor of unloaded cable is 0.04.
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