Code: 13A02502

R13

B.Tech III Year I Semester (R13) Supplementary Examinations June 2016

ELECTRICAL POWER TRANSMISSION SYSTEMS

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Give the expansion of GMR and GMD.
(b) What is skin effect and proximity effect?
(c) Draw equivalent T and π network.
(d) Define short, long and medium transmission lines.
(e) What are the factors affecting corona?
(f) Write the various types of insulators.
(g) For a 33 kV single core cable has a conductor diameter of 2 cm and a sheath of inside diameter 3 cm, find maximum and minimum stress in the insulation.
(h) What is the purpose of using intersheath and guard ring in a cable?
(i) What is the significance of stringing chart?
(j) Define reflected and refracted wave.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Derive the expression for inductance of a 3-phase overhead line for unsymmetrical spacing
(b) A single phase transmission line has two parallel conductors 3 m apart, the radius of each conductor being 1 cm. Calculate the loop inductance per km length of the line if the material of the conductor is: (i) Copper. (ii) Steel with relative permittivity of 200.

OR

3 (a) Derive the expression for capacitance of a single phase two-wire line system.
(b) Calculate the capacitance of a 100 km long 3-phase, 50 Hz overhead transmission line consisting of 3 conductors, each of diameter 2 cm and spaced 2.5 m at the corners of an equilateral triangle.

UNIT – II

4 (a) Derive the expression for A, B, C, D constants for nominal π –method for medium transmission lines.
(b) Briefly explain following terms: (i) Surge impedance loading. (ii) Ferranti effect. (iii) Charging current.

OR

5 (a) Derive the expression for A, B, C, D parameters for long transmission lines (rigorous method).
(b) An overhead 3-phase transmission line delivers 5000 kW at 22 kV at 0.8 p.f lagging. The resistance and reactance of each conductor is 4 ohms 6 ohms respectively. Determine: (i) Sending end voltage. (ii) Regulation. (iii) Efficiency.

UNIT – III

6 (a) Explain the methods of improving string efficiency.
(b) A single phase overhead line has two conductors of diameter 1 cm with a spacing of 1 meter between centers. If critical voltage for air is 21.1 KV/cm, for what value of the line voltage will corona commence?

OR

7 (a) Derive the expression for sag for equal supports level.
(b) Each conductor of a three phase overhead line is suspended from a cross arm of a steel tower by a string of 4 suspension insulators. The voltage across the second unit is 14.2 kV and across the third 20 kV. Find the voltage between the conductors and the string efficiency.

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UNIT – IV

8 (a) Explain following terms: (i) Attenuation. (ii) Distortion. (iii) Reflection coefficient. (iv) Refraction coefficient.

(b) A surge of 15 kV magnitude travels along a cable towards its junction with an overhead line. The inductance and capacitance of the cable and overhead line are 0.3 m henry, 0.4μF and 1.5 m henry, 0.012μF per km respectively. Find the voltage rise at the junction due to the surge.

OR

9 (a) Derive the expression for coefficient of reflection and refraction.

(b) An inductance of 800 μH connects two sections of a transmission line each having a surge impedance of 350 ohms. A 500 kV, 2 μsec rectangular surge travels along the line towards the inductance. Determine the maximum value of the transmitted wave.

UNIT – V

10 (a) Derive the expression for insulation resistance of a single-core cable

(b) A single core cable 5 km long has an insulation resistance of 0.4 MOHMS, the core diameter is 20 mm and the diameter of a cable over the insulation is 50 mm. Calculate the resistivity of the insulating material.

OR

11 (a) Derive the expression for capacitance of a single-core cable.

(b) Calculate the capacitance and charging current of a single core cable used on a 3-phase, 66 kV system. The cable is 2 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 5 and the supply at 50 Hz.

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