Code: 13A02502 **R13**

B.Tech III Year I Semester (R13) Supplementary Examinations June 2017

ELECTRICAL POWER TRANSMISSION SYSTEMS

(Electrical & 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) Explain the process of transposition of transmission lines and its advantages.

(b) Define GMD and GMR.

(c) Differentiate short and medium transmission lines.

(d) Explain the physical significance of het generalized A, B, C, D constants of a transmission line.

(e) What is corona? How it helps the environment?

(f) What is sag template and give its applications?

(g) Define reflection and refraction coefficients.

(h) Give the relation between surge impedance and velocity of propagation.

(i) List out the types of cables.

(j) What is meant by grading of cable and explain why it is necessary?

PART - B

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

UNIT - I

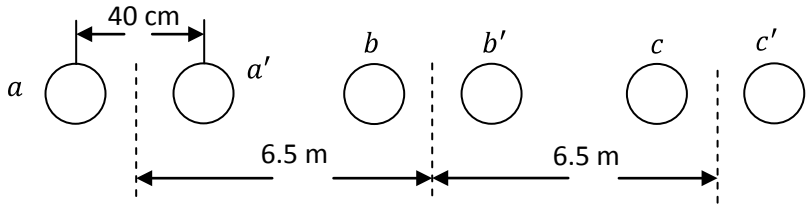
2 (a) Derive expression for the inductance of a symmetrical three phase line.

(b) A single phase transmission line has two parallel conductors 3 m apart each conductor being 1 cm. Calculate the loop inductance per km length of the material of the conductor is: (i) Copper. (ii) Steel with $\mu r = 100$.

OR

3 (a) Derive the expression for capacitance of a three-phase line by considering the effect of earth. Why for all practical purposes the effect of earth on the capacitance can be neglected?

(b) Determine the capacitance and charging current per km of a single circuit 220 kV line using two bundle conductors per phase as shown in figure below. The diameter of each conductor is 4.5 cm.



UNIT - II

4 Determine the A, B, C, D constants for a three phase 50 Hz transmission line, 250 km long having the following distributed parameters I = 1.15 x 10^{-3} H/km, c = 7.8 x 10^{-9} F/m, r = 0.14 ohms/km, g = 0.

OR

5 Derive the expressions for A, B, C, D parameters of a nominal–T and π of a medium length transmission lines.

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UNIT - III

6 (a) Derive the expressions for sag and tension when the supports are at equal heights.

(b) An overhead line has a span of 260 m. The weight of the line conductor is 0.68 kg per meter run. Calculate the maximum sag in the line. The ultimate strength of the conductor is 4550 kg. Assume factor of safety = 2.

OR

7 (a) Obtain expressions for the voltages across 4 units of an insulator string in terms of voltage across its top most unit.

(b) Distinguish between disruptive critical voltage and visual critical voltage. Give expressions for the same.

UNIT - IV

8 A surge of 25 kV traveling on a line of natural impedance 500 ohms arrives at a junction with two lines of impedances 500 ohms and 50 ohms respectively. Find the surge voltages and currents transmitted into each branch line. Also find the reflected surge voltage and current.

OR

9 Derive the expression for transient current wave, show that transient current is the sum of incident current and reflected current.

UNIT - V

10 (a) Show that the most economical size of the conductor in a cable is obtained when its sheath diameter is 2.718 times the core diameter.

(b) The maximum and minimum stresses in the dielectric of a single core cable are 40 kV/cm (r.m.s) and 10 kV/cm (r.m.s) respectively. If the conductor diameter is 2 cm, find thickness of insulation and operating voltage.

OR

11 (a) A single-core cable has a conductor diameter of 2.5 cm and insulation thickness of 1.2 cm. If the specific resistance of insulation 4.5 x 10^{14} ohm-cm, calculate the insulation resistance per kilo meter length of the cable.

(b) Explain any one method of the capacitance grading.

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