Code: 15A02502

R15

B.Tech III Year I Semester (R15) Regular Examinations November/December 2017

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) What is skin effect?
(b) What is the significance of transposition in transmission lines?
(c) What is the importance of surge impedance loading in transmission lines?
(d) Classify transmission lines based on voltages.
(e) What is a string chart? What are its uses?
(f) What is a corona? What are its effects?
(g) Define attenuation and distortion.
(h) Give the values of reflection and refraction coefficients when line is open circuited and short circuited.
(i) What is the function of sheath and bedding in a cable?
(j) What is meant by intersheath grading?

PART – B

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

UNIT – I

2 (a) Derive the expression for the capacitance of a transposed unsymmetrical 3 phase system.

(b) Calculate the capacitance of a conductor per phase of a three-phase 400 km long line, with the conductors spaced at the corners of an equilateral triangle of side 4 m and the diameter of each conductor being 2.5 cm.

OR

3 (a) Derive the expression for the capacitance of a conductor in a double circuit hexagonal spaced three phase system.

(b) A 3-phase, 50 Hz, 66 kV overhead transmission line has its conductors arranged at the corners of an equilateral triangle of 3 m sides and the diameter of each conductor is 1.5 cm. Determine the inductance and capacitance per phase, if the length of line is 100 km.

UNIT – II

4 (a) Draw phasor diagram of a short transmission line and derive an expression for voltage regulation.

(b) A 3-ø line delivers 3500 kW at 0.8 power factor (lag) to a load. The impedance of the line is (2+j5) Ω. If the sending end voltage is 33 kV, determine the receiving end voltage, line current and efficiency of the line.

OR

5 (a) What is a nominal-circuit representation? Find ABCD constants for nominal-T circuit of a transmission line.

(b) Find ABCD parameters of a 3-phase, 80 km, 50 Hz transmission line with series impedance of (0.15 + j 0.28) Ω per km and a shunt admittance of $j5 \times 10^{-4}$ mho per km for both π and T networks.

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UNIT – III

6 (a) Explain about the effect of radio interference due to corona on the transmission lines.

(b) A string of four suspension insulators is to be graded to obtain uniform distribution of voltage across the string. If the capacitance to ground of each unit is 10% of the capacitance of the top unit, determine the capacitance of the remaining three units.

OR

7 (a) Show that the maximum critical disruptive voltage occurs when the radius of conductor is d/e where d is the distance between conductors.

(b) Determine sag of an overhead line for the following data:

Span length = 160 meter

Conductor diameter = 0.95 cm

Weight per unit length of the conductor = 0.65 kg/meter

Ultimate stress = 4250 kg/cm^2

Wind pressure = 40 kg/cm^2 of projected area and factor of safety = 5.

UNIT – IV

8 (a) Discuss the behavior of a travelling wave when it reaches: (i) Short circuited. (ii) Open circuited transmission lines.

(b) An overhead transmission line with surge impedance 400 Ω is 300 km long. One end of this line is short circuited and at the other end a source of 11 kV is suddenly switched in. Calculate the current at source end after 0.005 sec from voltage is applied.

OR

9 (a) When the transmission line is terminated by the capacitive load, how do you find out the expressions of reflected voltage and current wave?

(b) A rectangular wave travels along a 500 km line terminated with a resistance of 1000 Ω. The line has a resistance of 0.32 Ω/km and surge impedance of 400 Ω. If the voltage at the termination point after two successive reflections is 200 kV, find the amplitude of the incoming surge.

UNIT – V

10 (a) Draw cross section of a 3-core belted high voltage cable and describe its various parts.

(b) A single core cable has a conductor diameter of 2.5 cm and a sheath of inside diameter 6 cm. Calculate the maximum stress. It is desired to reduce the maximum stress by using two intersheaths. Determine their best position, the maximum stress and the voltage on each. Consider the system voltage as 3-phase, 66 kV.

OR

11 (a) Deduce an expression for insulation resistance of a single core cable in terms of specific resistance of dielectric, its core and sheath diameter.

(b) A single core cable for 66 kV, three phase system has a conductor diameter of 2 cm and sheath of inside diameter 5.3 cm. It is required to have two intersheaths so that stress varies between the same maximum and minimum values in the three layers of dielectric. Find the positions of intersheaths, maximum and minimum stress and voltage on the intersheaths. Also find the maximum and minimum stress if the intersheaths are not used.

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