Code: 13A02502

R13

B.Tech III Year I Semester (R13) Regular Examinations December 2015

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) Explain the effect of ground on capacitance.
(b) Explain the significance of skin effect.
(c) Define surge impedance loading and surge impedance.
(d) Classify the types of transmission lines with an equivalent circuit.
(e) Define string efficiency and explain its significance.
(f) What is meant by sag template?
(g) Explain about propagation of surges.
(h) Explain reflection and refraction coefficients.
(i) What is meant by grading? List out the types of grading.
(j) List out the types of insulating materials.

PART – B

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

UNIT – I

2 (a) What are bundled conductors? Why are they used?

(b) Determine the capacitance per phase of a 3-phase, double circuit line, the conductors of which are arranged in hexagonal spacing, the distance between conductors being 2.5 m. The diameter of each conductor is 3 cm. Total length of line is 120 km.

OR

3 (a) Derive an expression for the inductance per phase of a 3-phase unsymmetrical line.

(b) A 1-phase line constructed 13.5 m above ground has spacing between the conductors 3.9 m. The radius of the conductor is 1.78 cm. Determine the capacitance of the line per length, considering the effect of earth and neglecting it.

UNIT – II

4 (a) Explain the terms efficiency and regulation in relation to transmission lines.

(b) A 3-phase, 50 Hz, 15 km transmission line supplying a total load of 850 kW at 0.8 p.f lagging and 11 kV has the following line constants: r = 0.45 ohms/km, x = 0.6 ohms/km. Calculate the line current, receiving end voltage, voltage regulation and efficiency of transmission.

OR

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

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UNIT – III

6 (a) Discuss the effect of both wind and ice on sag calculation.

(b) A 3-phase, 50 Hz, 110 kV line with 1 cm diameter conductors are constructed so that corona takes place if the line voltage exceeds 175 kV (rms). Determine the spacing between the conductors. Assume smooth conductor. Air density factor = 1.0.

OR

7 (a) What do you understand by grading of insulators? Explain.

(b) A transmission line conductor weighing 0.85 kg/m is subjected to a wind pressure of 60 kg/m^2 of projected area. The conductor has ice coating of 1 cm thick. If the maximum permissible sag is 7.5 m, determine the permissible span between span two level supports. Take a factor of safety 2 and given that the density of ice is 915 kg/m^2. Ultimate strength is 8000 kg and conductor diameter 2 cm.

UNIT – IV

8 (a) What is a Bewlwy-Lattice diagram? Explain its utility in the study of travelling waves.

(b) Explain the nature of refracted components of voltage and current at the junction of two lines of surge impedances Z_1 and Z_2.

OR

9 A 5 kV surge travels along a line of surge impedance 500 ohms.

(i) Find the magnitude of the incident current wave. The line is terminated by resistance of 800 ohms.

(ii) Find the rate of dissipation of energy and the values of reflected voltage and current waves.

(iii) What is the rate of energy reflection?

(iv) What should be the value of the terminating resistance so that energy in the wave is completely dissipated, transmitted and reflected power?

UNIT – V

10 (a) Explain the constructional features of 3 core cables. Sketch a 3 core cable.

(b) In a 3-phase 3 core metal sheathed cables, the measured capacitance between any two cores is 2 μF. Calculate the kilovolt amperes taken by cable when it is connected to 50 Hz, 11 kV bus bars.

OR

11 (a) Explain the theory of intersheath grading.

(b) A single core cable 1 km is length has a core diameter of 1.0 cm and a diameter under the sheath of 2.5 cm. The relative permittivity is 3.5. The power factor on open circuit is 0.03. Calculate: (i) The capacitance of the cable. (ii) Its equivalent insulation resistance. (iii) The charging current. (iv) The dielectric loss when cable is connected to 6600 V, 50 Hz bus bars.

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