Code: 13A02502 **R13**

B.Tech III Year I Semester (R13) Regular & Supplementary Examinations November/December 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) Explain skin effect.
(b) Why transposition of transmission lines required?
(c) Explain Ferranti effect.
(d) Define surge impedance loading.
(e) Define string efficiency.
(f) What is the use of stringing chart?
(g) Define attenuation constant.
(h) Define corona.
(i) What is grading of cables?
(j) Define insulation resistance.

PART – B

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

UNIT – I

2 (a) Clearly explain what you understand by GMR and GMD of a transmission line.
(b) What is equivalent spacing of a 3-phase line? What is its significance?
(c) Calculate the inductance of each conductor in a 3-phase, 3-wire system, when the conductors are arranged in a horizontal with spacing such that D_{RY} = 4 m; D_{YB} = 3 m; D_{BR} = 2 m. The conductors are transposed and each has a diameter of 2.5 cm.

OR

3 (a) How do we find line to neutral capacitance in a 3-phase system?
(b) The three conductors R, Y and B of a 3-phase line are arranged in a horizontal plane with D_{RY} = 1.5 m; D_{YB} = 2 m and D_{BR} = 3.5 m. Find line to neutral capacitance per km if diameter of each conductor is 1.2 cm. The conductors are transposed at regular intervals.

UNIT – II

4 (a) Draw the phasor diagram of medium transmission lines represented by a π model and derive the expression for voltage regulation.
(b) Determine the efficiency and regulation of a 3-phase, 50 Hz transmission line having resistance, inductance and capacitance of 10 ohms, 0.1 H and 0.9 micro farads respectively. The line delivers a load of 35 MW at 132 KV and 0.8 p.f. lag. Use nominal π method.

OR

5 (a) Starting from first principles deduce expressions for ABCD constants of a long line in terms of its parameters.
(b) The generalized circuit constants of a transmission line are:

A = 0.93 + j0.016 B = 20+ j140

The load at the receiving end is 60 MVA, 50 Hz, 0.8 power factor lagging. The voltage at the supply end is 220 KV. Calculate the load voltage.

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UNIT – III

6 (a) Explain different methods of improving voltage distribution across the insulating disc.

(b) A string of suspension insulator consists of four units. The capacitance between each pin and earth is one tenth of the self capacitance of the unit. The voltage between the line conductor and earth is 100 kV. Find: (i) The voltage distribution across each unit. (ii) The string efficiency.

OR

7 A transmission line has a span of 275 m between level supports. The conductor has an effective diameter of 1.96 cm and weight of 0.865 kg/m. Its ultimate strength is 8060 kg. If the conductor has an ice coating of radial thickness 1.27 cm and is subjected to a wind pressure of 3.9 gm/cm^2 of projected area, calculate sag for a safety factor of 2. Weight of 1 c.c. of ice is 0.91 gm.

UNIT – IV

8 A rectangular surge voltage E travels along a conductor of surge impedance Z_e towards a transition point P. Show that the voltage V_0 and current i_0 at point P satisfy the relation $V_0 = 2E – Z_e i_0$.

OR

9 Discuss the phenomenon of wave reflection and refraction. Derive expression for reflection and refraction coefficients.

UNIT – V

10 (a) What is the most general criterion for the classification of cables? Draw the sketch of a single core low-tension cable and label the various parts.

(b) A length of 3-core, 3-phase metal-sheathed cable gave the following results on test for capacitance: (i) capacitance between bunched conductors and sheath 1.0μF. (ii) Capacitance between two conductors bunched with the sheath and the third conductor, 0.6μF. With the sheath isolated, find the capacitance: (a) Between two conductors. (b) Between any two bunched conductors and the third conductor. (c) Calculate the capacitive current per phase when connection is made to 10 kV, 50 Hz bus-bars.

OR

11 (a) Derive the expression for the insulation resistance of a single core cable.

(b) A 11 kV, 50 Hz, single-phase cable has a diameter of 10 mm and an internal sheath radius of 15 mm. If the dielectric has a relative permittivity of 24, determine for a 2.5 km length cable: (i) The capacitance. (ii) The charging current.

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