Printed Pages : 6 | 564/548 | NEE-501/EEE-503

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 121501/121523 Roll No. | | | | | | | | | |

B.Tech.

(SEM. V) THEORY EXAMINATION, 2015-16

ELEMENTS OF POWER SYSTEM

[Time : 3 hours] **[Total Marks : 100]**

Note : Attempt all sections.

Section-A

1. Attempt **all** parts. All part carry **equal** marks. Write answer of each part in short. (2×10=20)

   (a) Discuss the effect of change in temperature on length of overhead transmission line.

   (b) An ACSR conductor having a diameter of 1 cm has an internal inductance equal to 0.05 mH/km. If it is replaced by another ACSR having a diameter to 2 cm then calculate its internal inductance.

   (c) Define Skin effect.

(d) Draw single line diagram of a typical power system.

(e) What are the methods used for equalizing the potential across the insulator string in transmission lines?

(f) Define Criticasl disruptive voltage & Visual critical voltage.

(g) What is the need of transposition of transmission lines?

(h) What is the need of grounding the neutral in power system?

(i) Calculate the reactance of a coil suitable for a 33KV, 3-Φ transmission system of which the capacitance to earth of each conductor is 4.5 μ F.

(j) Describe the vibrations of power conductors and explain the methods used to damp out these vibrations.

Section-B

Attempt **any five** questions from this section.

(10×5=50)

2. The daily load cycle of a three phase, 33 kV, 10km transmission line is as follows: 2500 kV A for 8 hours, 2000 kV A for 9 hours and 1500 kV A for 7 hours. Determine the most economical cross section if the cost of line including erection is Rs (7500) + 6000a) per km where 'a' is the area of each conductor in sq. cm. the rate of interest and depreciation is 8 per cent and cost of energy is 15 paise per unit. The line is in use for 250 working days a year. The resistance per km and per sq. cm. is 0.173 ohm.

3. (a) What are ACSR conductors? Explain the advantages of ACSR conductors.

   (b) A 50 km long transmission line supplies a load of 5MVA, 33kV at 0.8 power factor lagging. The efficiency of transmission is 90%. Calculate the volume of conductor aluminum required for the line when

   1-Φ, 2- wire system is used.

   3-Φ, 3-wire system is used.

   Take the resitivity of Aluminium as $2.85\times10^{-8}\Omega$–m

4. Derive the inductance per phase for a three phase transposed transmission line. Also clacilate the inductance for Horizontal & equilateral tringular configuration.

5. Derive A, B, C and D parameters for Nominal π model of a medium line and draw its phasor diagram.

6. Determine the corona characteristics of a three phase 160 km long line having conductor diameter 1.036 cm, 2.44 m delta spacing, air temperature 26.67 degree having an appropriate barometric pressure of 73.15 cm, operating voltage 110kV at Hz. Surface irregularity factor 0.85. Assume a value of $m_v = 0.72$ dielectric strength of air = 21.1 kV/cm (rms). Disruptive voltage under foul weather = 0.8 times fair weather value.

7. Derive expression for sag and tension in power conductor strung between two supports at equal heights taking into account wind and ice loading.

8. What is neutral grounding? Describe different methods of neutral grounding. List their advantages and disadvantages.

9. What are the advantages associated with D.C. transmission. Explain different type of D.C. links used for HVDC transmission.

Section-C

Attempt **any two** questions form this section.

(2×15=30)

10. (a) Explain the term surge impedance loading (SIL)?

(b) The A, B, C, D constants of a 3-Φ transmission line are A =D = 0.936+j0.016, B = 33.5+j138Ω and C= (-0.9280+j901.223) × 10^{-6} mho. The load at receiving end is 40 MW, 200kV at power factor of 0.86 langging. Find the magnitude of the sending end voltage, current, power and voltage regulation. Assume that the magnitude of sending end voltage remains constant.

11 (a) What are the main requirements of the insulating materials used for cables? Derive an expression for the insulation resistance of a single core metal sheathed cable.

(b) Each line of a 3-phase system is suspended by a string of 3 identical insulators of self- capacitance C farad. The shunt capacitance of connecting metal work of each insulator is 0.2 C to earth and 0.1 C to line. Calculate the string efficiency of the system if a guard ring increases the capacitance to the line of metal work of the lowest insulator to 0.3 C.

12. (a) Give a comparison of an Overhead line with Underground cable as a medium of power transmission.

(b) What are various FACTS controllers? Explain the operating principle of any one of them.

(c) What is a bundle conductor and how does the use of bundled conductor reduce corona loss in EHV line?

—x—