Printed Pages: 4 NEE-501

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

Paper ID : 2012377 Roll No. | | | | | | | | | |

B.TECH.

Regular Theory Examination(Odd Sem-V) 2016-17

ELEMENTS OF POWER SYSTEM

Time : 3 Hours *Max. Marks : 100*

Section - A

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

a) Draw the symbols of various components of a power system which are used in Single-Line diagram representation.

b) Explain the following components of distribution power system

i) Feeder ii) Service mains

c) Draw and explain 3-wire dc system.

d) Why receiving end voltage appears high compared to sending end voltage in case of lightly loaded transmission lines?

e) What is the need for stranding the conductors?

f) What is proximity effect?

g) Why is leakage conductance negligible in overhead lines?

h) What is the mechanism of breakdown of an under ground cable?

i) Where do we use grounding transformer?

j) What is meant by 'Skin effect'?

Section - B

Note: Attempt any five questions from this section

(5×10=50)

2. What is the difference between isolator and circuit breaker? A single phase ac system supplies a load of 200 kW and if this system is converted to 3-phase, 3-wire ac system by running a third similar conductor, calculate the 3-phase load that can now be supplied if the voltage between the conductors is the same. Assume p.f. and transmission efficiency to be same in both cases.

3. Explain the limitations of 'Kelvin law'. A 2-wire feeder carries a constant current of 250A through out the year. The portion of capital cost which is proportional to the area of cross section is Rs. 5 per kg of copper conductor. The interest and depreciation of total 10% per annum and the cost of energy is 5 paisa per kWh. Find the most economical area of cross section of the conductor. Given that the density of copper is 8.93 gm/cm^2 and its specific resistance is $1.73 \times 10^{-8} \Omega m$.

4. Find the inductance per phase per Km of double circuit 3-phase line system shown in fig (1). The conductors are transposed and are of radius 0.75 cm each. The phase sequence is abc.

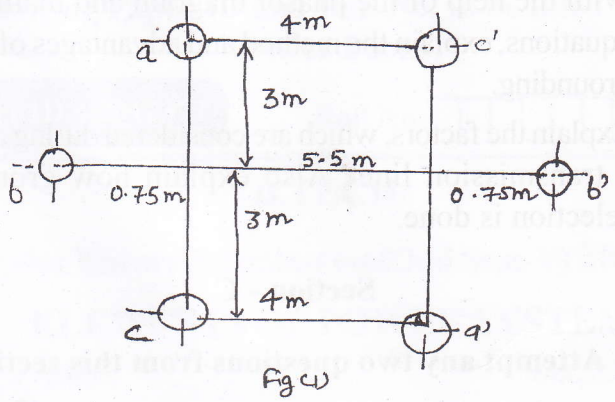

Fig (c)

5. Explain Corona loss. How is disruptive critical voltage estimated? Give advantages and disadvantages of Corona loss.

6. A string of n suspension insulators is to be fitted with a guard ring. If the pin to earth capacitance are all equal to C, derive the general expression for the line to pin capacitor in terms of n, C and P (number of pins), so as to give uniform voltage distribution over the string.

7. Why do the vibrations get generated in conductors? How are they damped?

   A 132 KV transmission line has the following data :

   Wt. of conductor = 680 kg/km; Length of span = 260 m

   Ultimate strength = 3100 kg; Safety factor = 2

   Calculate the height above ground at which the conductor should be supported. Ground clearance required is 10 m.

8. With the help of the phasor diagram and mathematical equations, explain the method and advantages of resonant grounding.

9. Explain the factors, which are considered during designing a transmission line? Also explain how ground wire selection is done.

Section - C

Note: Attempt any two questions from this section

(2×15=30)

10. What are the commonly used insulating materials for underground cables? Describe with a neat sketch, the construction of a 3-core belted-type cable.

    Calculate the KVA taken by a 10 km long, 3-phase 3-core cable, if the capacitance measured between any two cores is 0.3 μF/km when it is connected to 10 KV, 50 Hz bus-bar.

11. Describe the various conductor configurations and choice of number of circuits for EHV transmission lines.

    Compare HVDC with HVAC transmission on at least 5 major grounds.

12. Explain surge impedance loading. Determine ABCD constants for a 3-phase 50 Hz transmission line 200 km long having the following distributed parameters $l = 1.3 \times 10^{-3}$ H/Km, $C = 9 \times 10^{-9}$ F/Km, r = 0.20 Ω/Km g = 0.