**Printed Pages:02** **Subject Code:NEE501 / EEE503**

**Paper Id:** **120515** **Roll No:** | | | | | | | | | | |

**B TECH**
**(SEM V) THEORY EXAMINATION 2018-19**
**ELEMENTS OF POWER SYSTEM**

***Time: 3 Hours*** ***Total Marks:100***

**SECTION – A**

**1.** Attempt **ALL** the parts. **(2×10=20)**

a. What are the various components of a power system?
b. Compare overhead and underground system of transmission.
c. Explain skin effect in brief.
d. What are advantages of bundled conductor?
e. Explain Ferranti effect with suitable phasor diagram.
f. What is sag in transmission line?
g. Explain the critical disruptive voltage and critical visual disruptive voltage.
h. Why does the vibration get generated in conductor? How are they damped?
i. Distinguish between ac & dc resistance of a conductor.
j. Give reason why ACSR conductors are preferred for transmission line and distribution line over other types of conductors.

**SECTION – B**

**2.** Attempt any **THREE** parts. **(10×3=30)**

a. Determine the best current density in Amps/mm2 for a three phase overhead line. The line is in use for 2600 hours per year and if the conductor costs Rs 3 /Kg. It has a specific resistance of 1.73 × 10-8 Ω- m and weighs 6200 Kg/m3. Cost of energy is 10 paisa/unit. Interest and depreciation is 12 % of conductor costs.
b. Derive the expression for inductance of a 3-Φ unsymmetrical spaced transposed transmission line.
c. A 3-phase line, 3 Km long line delivers 3000 KW at a power factor of 0.8 lag to load. If the voltage at supply end is 11 KV, determine the voltage at the load end and efficiency of transmission. The resistance and reactance per Km of each conductor are 0.4 Ω and 0.8 Ω respectively.
d. Explain the phenomenon of corona? How is disruptive critical voltage estimated? What are the factors that affect the corona loss? Give advantage and disadvantage of it.
e. Derive the expression for the lowest point of the catenary curve if the supports are at different levels. Given that weight of conductor = 0.35 kg/m, maximum allowable strength = 800 kg, span length = 160 m and safety factor = 2, find the minimum point of catenary if supports are at 70 m and 65 m.

**SECTION - C**

**3. Attempt any one part** **(10x1=10)**

**a.** Show that for overhead systems the ratio of volume of conductor in dc, single phase ac & 3-phase ac are given by V1:V2:V3 = $1:1/2\cos^2\phi:2/\cos^2\phi$, where cos ϕ is the power factor of the load. Assume equal power transmitted over equal length with equal losses & maximum voltage to earth to be same in all cases.

**b.** Show that at higher voltage and at higher power factor, the efficiency of transmission line will be increased. What are the limiting factors of high voltage transmission lines?

**4. Attempt any one part (10x1=10)**

a. A three phase 50 Hz transmission line has flat horizontal spacing with 3.5 m spacing between the adjacent conductors. The conductors have outside dia of 1.05 cm. The line voltage is 110kV. Find the capacitance to neutral & charging current per km of the line.
b. Derive the expression for sending end voltage and current in terms of receiving end voltage and current for long transmission lines. What do you understand by characteristics impedance and propagation constant in it?

**5. Attempt any one part (10x1=10)**

a. In a string insulator having five units, the self capacitance of insulator units is 6 times to that between a unit and earth. Obtain the potential distribution across each unit in the string as percentage of potential of conductor with respect to earth. Also find the string efficiency.
b. Why is capacitance grading requires in cables? How it is done explain any one.

6. **Attempt any one part (10x1=10)**

a. Derive expressions for sag & tension in a power conductor strung between two supports at equal height & unequal height taking into account the wind & ice loading also.
b. Explain (i) surge impeedance loading (ii) Sag Template.

**7. Attempt any one part (10x1=10)**

a. What is the need of grounding? Describe briefly the various grounding techniques.
b. Compare EHV AC & HVDC transmission system.