

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

PAPER ID : 2057

Roll No.

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B. Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION

2010-11

ELEMENTS OF POWER SYSTEM

Time : 3 Hours

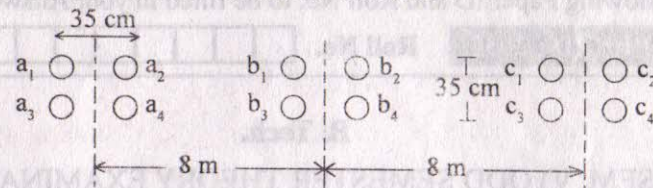
Total Marks : 100

Note : Attempt all questions.

1. Answer any two parts : (10×2=20)
 - (a) Give reasons :
 - (i) The voltage drop is a very important consideration in transmission lines but not in Distribution.
 - (ii) It is necessary to use high voltages for transmission system.
 - (iii) The tendency of corona formation is lesser in bundled conductors.
 - (b) Explain proximity and skin effect with their demerits.
 - (c) Explain ferranti effect mathematically and graphically for a long transmission line.

2. Answer any two parts : (10×2=20)
 - (a) Derive expression of inductance in per phase per km for a fully transposed 3-phase line.
 - (b) Determine the capacitance and inductance per kilometre length of a double-circuit three-phase line, as shown in

figure below the transmission line is transposed. The diameter of each conductor is 25 mm.



- (c) A short 3-phase 132 kV line is delivering 15 MW at rated voltage and 0.85 lagging power factor. The line loss is 7.5% of received power. If line resistance is $0.905 \Omega/\text{phase}/\text{km}$, find the length of line.

3. Answer any **two** parts : **(10×2=20)**

- (a) Detail out Audible Noise, Radio interference and Visual Corona.

Determine the Corona characteristics of a 3- ϕ line 200 km long conductor dia 1 cm, 2.5 m delta spacing, air temperature 27°C , altitude 2440 m, corresponding to an approximate barometric pressure of 73.15 cm, operating voltage 110 kV at 50 Hz.

- (b) What is an insulator? Why it is used? Classify them.
- (c) Each line of a 3-phase system is suspended by a string of 3-identical insulators of self-capacitance c farads. The shunt capacitance of metal work of each insulator is $0.26C$ to earth and $0.15C$ to line. Find string efficiency if a guard ring increases the shunt capacitance to line of the metal work of the lowest insulator to $0.35C$.

4. Answer any **two** parts : **(10×2=20)**

- (a) Write short notes on any **three** :

- (i) Stringing chart
(ii) Span length
(iii) Sag template
(iv) Vibration dampers.

- (b) A transmission line conductor is having a diameter of 20 mm and weighs $1.0 \text{ kg}/\text{m}$. The span is 280 m. The wind pressure is $40 \text{ kg}/\text{m}^2$ of projected area with ice coating of 10 mm. The ultimate strength of conductor is 1000 kg. Calculate the maximum sag if the factor of safety is 2 and ice weighs $910 \text{ kg}/\text{m}^3$.

- (c) A single core cable has a conductor radius of 14.5 mm and an insulation thickness of 4.6 mm. Find the capacitance per meter length of cable if the dielectric has a relative permittivity of 3.2.

5. Answer any **two** parts : **(10×2=20)**

- (a) Draw the equivalent circuit of the HVDC link. Derive the expression for DC link current in terms of the firing angle at convertor stations.

- (b) What are the advantages and disadvantages of HVDC system for transmission? Describe in detail.

- (c) Explain Peterson's coil type of Neutral grounding.

A 220-kV, 3-phase, 50 Hz transmission line of 150 km consists three conductors equilaterally spaced with 7 m and having effective diameter of 3 cm. Find the inductance and MVA rating of the Peterson's coil in the system.