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

PAPER ID : 2057   Roll No. [| | | | | | | | | |]

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.
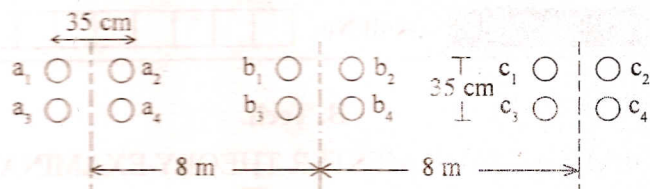
(c) A short 3-phase 132 kV line is delivering 15 MW at rated voltage and ·85 lagging power factor. The line loss is 7·5% of received power. If line resistance is ·905 Ω/phase/km, fixed the length of line.

3. Answer any **two** parts : $(10 \times 2 = 20)$

   (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 ·26C to earth and ·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 ·35C.

   Answer any **two** parts : $(10 \times 2 = 20)$

   (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 kg 1 m. The span is 280 m. The wind pressure is 40 kg/m² 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 kg/m³.

(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.