[5354]-630
B.E. (Electrical)
EHV AC TRANSMISSION
(2012 Pattern) (Semester - I) (Elective - II)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

   1)   *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.*

   2)   *Neat diagrams must be drawn wherever necessary.*

   3)   *Figures to the right indicate full marks.*

   4)   *Assume Suitable data if required.*

   5)   *Use of calculator is allowed.*

Q1) a)   The field strength on the surface of a sphere of 4 cm diameter is equal to the corona inception gradient in air of 30 kv/cm. Find the charge on sphere. **[4]**

     b)   A power of 2,000 MW is to be transmitted over a distance of 1600 km. The alternative used is 3 phase 400 kV and 1000 kV AC line. Suggest the number of circuits required, currents transmitted and the total line losses. Assume r and x of conductor as 0.0136 ohm/km & 0.272 ohm/km for 400 kV line and 0.0036 ohm/km and 0.231 ohm/km for 1000 kV line respectively. **[8]**

     c)   Derive expression for inductance of multi conductor lines and state Maxwell's coefficients. **[8]**

OR

Q2) a)   Calculate Geometric Mean Radius (GMR) of a bundled conductor for 750 KV AC line having 4 sub conductors each of 3.46 cm diameter and sub conductor spacing 45 cm. **[6]**

     b)   Explain the field of a point charge and its properties. Derive the equation for the electrostatic field of a point charge. **[7]**

     c)   Explain different types of vibrations of transmission conductors in brief. **[7]**

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Q3) a) Evaluate the horizontal, vertical and total value of electrostatic field components near the single circuit transmission line which are energized by three phase voltages. **[9]**

b) Discuss the effects of high electrostatic field on : **[9]**
   i) Humans
   ii) Animals
   iii) Plants

<div align="center">OR</div>

Q4) a) Explain the terms in detail : **[9]**
   i) Primary shock current
   ii) Secondary shock current
   iii) let-go currents

b) Derive the expression for electrostatic induction on unenergized circuit of double circuit line. **[9]**

Q5) a) Write a note on 'Measurement of Audible Noise' produced by corona. **[8]**

b) Draw a charge-voltage diagram and derive an expression $Pc = 1/2 KC (Vm^2 - Vo^2)$ for corona loss. **[8]**

<div align="center">OR</div>

Q6) a) Discuss visual corona under standard operating condition and conditions other than standard operating condition. **[8]**

b) Explain the quantities on which the audible noise depends for the EHV AC lines. **[8]**

Q7) a) Brief, the line insulation design based upon transient over voltages. **[8]**

b) Explain detail classification of cables and mention typical insulation thickness for EHV cables. **[8]**

<div align="center">OR</div>

Q8) a) State the design factors considered under steady state condition of transmission line. Also state their limits for satisfactory performance. **[8]**

b) Define tan δ loss factor and derive an expression for insulation resistance of a cable. **[8]**

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