

Total No. of Questions : 12]

SEAT No. :

P1195

[Total No. of Pages :3

[4659] - 74

B.E. (Electrical)

EXTRA HIGH VOLTAGE TRANSMISSION

(Semester - I) (2008 Course) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answer three questions from Section I and three questions from Section - II.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Black figures to the right side indicate full marks.*
- 6) *Use of logarithmic tables, Slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION - I

- Q1)** a) Find power handling capacity of 400 kv three phase ac lines over a transmission distance of 800 km. Take phase difference between sending and receiving end voltage as 30 degree. The reactance and resistance of line are 0.327 ohm/km and 0.031 ohm/km respectively. Also find line current and % power loss. If total power to be transmitted is 1850 MW find the number of circuits required. **[8]**
- b) Discuss the causes of oscillations and vibrations of ehv transmission line. **[8]**

OR

- Q2)** a) Derive equations for travelling waves due to transients set up in the line. Also derive expression for solution of travelling wave equations. Write equation for characteristic impedance and velocity of propagation for loss free line. **[10]**
- b) The total inductance of transmission line is 265 microhenry/km and capacitance 0.165 microfarad/km. Find the velocity of surge voltage in the line. Also find the surge impedance. Assume loss free line. **[6]**

P.T.O.

Q3) a) For ehv ac three phase transmission line considering image charges derive expression for flux linkage matrix, inductance matrix and capacitance matrix. Indicate self and mutual inductances. [10]

b) State and explain the advantages of bundled conductors. [6]

OR

Q4) a) Considering sequence components of currents find the expression for zero sequence and positive sequence inductances of the transposed three phase ac transmission line. [10]

b) Write note on diagonalization of inductance matrix. [6]

Q5) a) The conductors of single phase ac line are of diameter 'd' meter and length 1 meter and '2d' meter apart. They have charges +q and -q coulombs. Derive expression for potential difference and capacitance between the two conductors. What changes will be there in these expressions if image charges of these conductors are considered. [10]

b) The charge +Q1 coulomb is placed at the centre of sphere 1 of radius 'R' meter.

Another sphere 2 of same radius is placed on the right side of sphere 1. The centre to centre distance is 'S' metre. the surface potential of sphere 1 is $V = Q1 / (4\pi\epsilon_0 R)$. Explain the procedure of placing charges in the spheres to have surface potentials of spheres 1 and 2 as V and zero volts respectively. Draw the labelled neat sketch. [8]

OR

Q6) a) Derive expressions for maximum and minimum potential gradients on bundle of two sub conductors. Draw the neat sketch and indicate locations of maximum and minimum potential gradients. State the assumptions made in deriving these expressions. Also write expressions for maximum and minimum potential gradients when 'n' sub conductors are there. What is meant by stress doubling effect? [12]

b) Compare electric fields of point charge and line charge. [6]

SECTION - II

Q7) a) Explain the steps for calculating the electrostatic ally voltage induced in the conductors of unenergised circuit of double circuit line. [10]

- b) Draw labelled sketch of truck parked parallel to ehv transmission line under it at distance 'L' meter. The height of conductor above ground is 'H' metre, height of truck body is 'v' meter, width and length of truck are 'b' and 'a' respectively. The truck body is 't' meter above the ground. [6]

OR

Q8) a) Write note on biological effects of electrostatic field on human, animals and plant life. [8]

b) Write note on shock currents. [8]

Q9) a) Draw the neat sketch showing the various main components of HVDC system. Explain the function of each component. [8]

b) With neat diagram explain the operation of three phase full wave bridge rectifier. State the effects of ignition angle delay and commutation overlap angle on the magnitude of dc voltage. [8]

OR

Q10)a) Draw the neat sketch showing rectifiers and inverters of three phase circuit of HVDC system. Explain how the inverter operation takes place. [10]

b) The line voltage of three phase bridge rectifier circuit is 120 kv, ignition delay angle is 120 degree. Find the magnitude of dc voltage. [6]

Q11)a) Write note on converter ideal and actual control characteristics. [10]

b) State and explain the requirements of satisfactory operation of HVDC link. [8]

OR

Q12)a) What is meant by converter firing control system. Explain individual phase control system. State its advantages and drawbacks. [10]

b) Write note on problems associated with operation of a dc system when connected with weak ac system. State remedial actions to overcome problems. [8]

