May - June - 2012

Total No. of Questions : 12]

SEAT No. :

P1381

[Total No. of Pages : 4

[4164] - 510

B.E. (Electrical)

EXTRA HIGH VOLTAGE TRANSMISSION

(Elective - II) (2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) *Answer any one questions from each unit of section I & section II.*
2) *Answer 3 questions from section I and 3 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) *Figures to the right indicate full marks.*
6) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
7) *Assume suitable data, if necessary.*

SECTION - I

Unit - I

Q1) a) Explain the terms attenuation and distortion of travelling wave. Explain the causes of attenuation and distortion. **[10]**

b) If total inductance of a transmission line is 265 MH (microhenry) and total capacitance 0.165 microfarad find velocity of surge voltage in the line.

If this line is energized by a unit step voltage 1.0 V at the sending end and open circuited at the receiving end. Obtain the resultant voltage at the receiving end. **[6]**

OR

Q2) a) A power of 2000 MW is to be transmitted from a super thermal power station over 800 km. The alternator used is 400 kV alternator. Suggest the number of circuits required. Find the current per circuit, power loss per circuit and the total power loss. The reactance of line 0.327 ohm/km and resistance 0.031 ohm/km Take $\sin\delta = 0.5$. **[8]**

b) Write note on types of vibrations and oscillations of transmission line. **[8]**

P.T.O.

Unit - II

Q3) a) Explain how the possibility of corona discharge is reduced if bundle conductor is used instead of one solid conductor. Also derive the expression for the equivalent radius of bundle conductor in terms r, n, R, B where B is bundle spacing, R is bundle radius, n is number of subconductors and r is radius of each sub conductor. **[8]**

b) A 3 phase 750 kV horizontal line has minimum height 12 meter, sag at midespan 12 meter, phase spacing S = 15 meter, conductors are 4×0.035 meter. with bundle spacing B = 0.4572 meter calculate per kM the inductance matrix for untransposed line. **[8]**

OR

Q4) a) Derive the expression for inductance matrix of three bundle conductors of 3 phase line. Hence write the expression for capacitance matrix. Indicate the self and mutual capacitances. Assume untransposed line. **[8]**

b) Explain how to find out the inductance matrix for transposed line from inductance matrix of untransposed line. Also how sequence inductances are found out? **[8]**

Unit - III

Q5) a) A sphere gap with spheres having radius R = 0.5 m and gap of 0.5 m between their surfaces. **[10]**

Calculate the required charges and their locations to make the potentials 100 and 0. Do the calculations upto two charges located in each sphere.

b) Two conductors of charges q_1 and q_2 Coulomb are located H_1 meter and Hz meter above the ground surface. The horizontal distance between two conductors is denoted as A_{12} Derive the expressions for potentials V_1 and V_2 to ground of these conductors considering the charge of other conductor and image charges also. **[8]**

OR

Q6) a) Two conductors of two phases are very far from each other. Each conductor consists of two subconductors of bundle spacing B and bundle radius R, and radius of subconductor "r" Neglecting image charges and charge of other phase conductor derive expression for maximum and minimum potential gradient on the surface of each sub conductor. With neat diagram show the locations of maximum and minimum potential gradient. Also find expression for average potential gradient. **[10]**

b) A 420 kV 3 Phase line, have conductors 13 meter above the ground phase spacing is S = 11 meter, Bundle spacing is B = 0.45 meter, radius of each subconductor is 0.0159 meter calculate maximum surface voltage gradient on center and outer conductors using Mangolt formula. **[8]**

SECTION - II

UNIT - IV

Q7) a) Explain the procedure for finding out electrostatically induced voltage in any conductor of unenergized three phase circuit of a double circuit line. **[8]**

b) Write note on effects of magnetic fields on human health. **[6]**

c) Now a days how is insulated ground wire utilized. **[2]**

OR

Q8) a) Explain the procedure for finding out the electrostatic field of 3-phase line. **[8]**

b) Explain the terms

i) Threshold current and

ii) Let go current.

Write expression for tolerable current in miliampere in terms of duration of current. State the effects of shock currents of different magnitude on humans. **[8]**

Unit - V

Q9) a) For three phase full wave bridge rectifier circuit derive expression for output dc voltage and dc current at ignition delay angle α. **[8]**

b) Draw the equivalent circuit of bridge rectifier to indicate the effect of commutation overlap on dc voltage magnitude write expression for equivalent commutating resistance. **[4]**

c) It is required to obtain dc voltage of 100 kV from a three phase bridge rectifier operating with ignition delay angle 30° and commutation overlap 15°. Calculate the necessary line voltage of rectifier transformer. **[4]**

OR

Q10) a) Explain the terms commutation and commutation delay time. State the reason for commutation delay. Derive expression for commutation voltage. **[8]**

b) Derive the expression for transient value of ignition delay angle α_t beyond which inversion takes place, when commutation overlap is absent. Also derive α_t when commutation overlap angle μ is present and hence state the effect of μ on the transient value α_t.

Explain how the reversal of power takes place. Why it is necessary have presence of alternating voltage on primary side of inverter transformer? **[8]**

Unit - VI

Q11) a) Write note on ideal & actual V- I characteristic of converter of HVDC. **[10]**

b) State & explain the important requirement for satisfactory operation of HVDC link, for selection of control characteristic. **[8]**

OR

Q12) a) Write note on individual phase control system of firing angle control. **[10]**

b) Discuss the problems associated with weak ac system in operation of dc system. **[8]**

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