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RM-7759

B. E. IV (Sem. VIII) (Elect.) Examination

May / June – 2010

Extra High Voltage AC/DC Transmission

Time : 3 Hours] [Total Marks : 100

Instruction :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 4 (Sem. 8) (Elect.)**

Name of the Subject :

☛ **Extra High Voltage AC/DC Transmission**

☛Subject Code No. : **7 7 5 9** ☛Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Attempt **all** questions.

(3) Answer to the **two** sections must be written in **separate** answer books.

(4) Figures to the extreme **right** indicate marks.

(5) Make suitable assumption wherever **necessary**.

(6) Use of calculator model Fx 100 W or equivalent is permissible.

Section 1

Q1(a) **Fill in the blanks with appropriate words.** **(6)**

1. Power handling capacity of one 750kv line is _____times that of 400kv line.
2. Power transfer ability of EHV lines may be increased by using _____or adding a _____.
3. The conductor of an EHV transmission line is selected on the basis of _____.
4. For the 400kv, 800km long transmission line if it is required to maintain 400kv at receiving end under no-load condition _____ type of compensation is provided at receiving end.
5. AC line can transfer only _____% of its steady state power limit.
6. For a long uncompensated line the limit to the line loading is governed by _____.

Q1(b) The size of the conductor & spacing between conductors affect the line Performance, give the reasons. **(4)**

Q1(c) A power of 5000 MW is required to be transmitted over a distance of 1ooo KM. using 750 Kv, 3-phase transmission line. **(10)**

Determine:

(1) The number of circuits required using shunt compensation only. State the assumptions made.

(2) % loss in the line & efficiency of the line for transmission of this power & the number of circuits determined in (1).

(3) Transmitted & received reactive powers at the maximum permissible sending end & receiving end voltages & 30^0phase angle difference.

DATA: System Kv= 750. Maximum operating voltage= 765 Kv.
Number of conductor in the bundle/conductor size= 4X30 mm.
Bundle diameter = 63.6 cm . Resistance Ohm/km=0.0136, X-Ohm/km =0.272 at 50 Hz (approx.).
Average conductor height =18 m., Spacing between successive phase (horizontal spacing) =15 m.
Positive sequence line capacitance in nf/km (approx.) = 12.83.

Q (2) Determine for a 750 Kv horizontal 3-phase transmission line: **(15)**

(1) Inductance matrix for untransposed line per km.
(2) Inductance matrix for transposed line per km.
(3) Positive, negative, & zero sequence inductances &reactance per km. for transposed configuration.
(4) Eign values of the inductance matrix for transposed line per km.

OR

Q.2 A conductor 5cm diameter strung inside an outer cylinder of 2 meters radius find **(15)**

{a} The corona inception gradient on the conductor kv/cm.
(b) The corona inception voltage in kv (rms).
(c) The gradient factor for the electrode arrangement.
(d) The capacitance of the co-axial arrangement per meter
(e) The surge impedance.

Q.3. Attempt any three from the following **(15)**

1. What are bundle conductors? Discuss the advantages of bundle conductors.
2. Calculate the generalized constants (A_T,B_T,C_T & D_T) for a transmission line with shunt reactors at both ends.
3. State the properties of field of point charge.
4. Explain I^2R loss & corona loss. On what factors corona loss depends.
5. Derive an expression for maximum charge condition on a 3-phase line.

Section 2

Q.4.(a) Fill in the blanks with appropriate words. **(6)**

(I) In HVDC transmission system, rectifier angle alpha is kept near _____.
(II) The DC transmission is mainly at _____ kv.
(III) A DC reactor is connected in series with each pole of a converter station in order to prevent _____ failure in the inverter.
(IV) The first commercial used HVDC link was built in _____.
(V) The power transmission capability of bipolar lines is approximately_____ 3- phase single circuit line.
(VI) The cost per unit length of a DC line is much _____ as compared to AC line.

Q 4(b) State the advantages & disadvantages of ground returns line. **(4)**

Q. 4(c) Describe different types of DC links with the help of diagram. Compare merits & demerits of the different types of DC links. **(10)**

Q.5.(a) Draw the circuit diagram of three phase bridge converter circuit suitably connected to give 12 pulses DC output. **(10)**

Q. 5 (b) List three dangerous conditions which give rise to SSR & the entire counter measures to guard against them. **(5)**

OR

Q.5.(a) A three phase bridge inverter has commutation reactance of 100 ohm, the current & voltage at the DC side is 950 A & 245 kv, respectively. The AC line voltage is 325 kv. Calculate the extinction angle & the overlap angle. **(7)**

(b) Assume for a 3- Phase bridge rectifier the transformer secondary leakage reactance is 0.3 ohm and the line voltage is 440 volt. If the output current is 220 Amp, Find the angle of overlap and D.C output voltage at a delay angle of 15 degree? **(8)**

Q.6. Attempt any three from the following. **(15)**

(I) Explain different methods used in HVDC system for power flow regulation.
(II) What is back to back connection? Why it is required?
(III) Write short note on reactive VAR requirements of HVDC converters.
(IV) Derive & draw the equivalent circuit for six pulse inverter.