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SF-7759

B. E. - IV (Sem - VIII) (Electrical) Examination

May / June – 2011

Extra High Voltage AC/DC Transmission Line

Time : **3** Hours] [Total Marks : **100**

Instructions :

(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) (Electrical)**
Name of the Subject :
☛ **Extra High Voltage AC/DC Transmission Line**
☛Subject Code No. : **7 7 5 9** ☛Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Attempt all questions.
(3) Make suitable assumptions, where ever necessary.
(4) Figures to the right side indicate full marks.
(5) Scientific calculator fx 100 or equivalent ie permissible.
(6) Following data may be assumed wherever needed.
System = 400kV
Number of conductors in the bundle/conductor size - 2×3.18 cm
Bundle Diameter - 45.72 cm
Resistance (Ω/km) - 0.031
Reactance (Ω/km) - 0.327
Average conductor height H - 15 m
Phase specing - 11 m
(Horizontal specing)

SECTION - I

1 (a) Fill the blank with appropriate words : **6**

(1) Intermediate substation is necessary of interval of _____ km to _____.

(2) Bundle conductor reduce the _____ and _____.

(3) Power transfer capability is increased of EHV lines may be increased by using _____ or adding _____.

(4) % power loss in transmission line remains independent of _____ and its depends upon _____.

(5) Synchronous condensers provides _____ of MVAR's.

(6) One 750 kV line can normally carry as much as power as _____ 400kV circuits for equal distance of transmission.

(b) Determine the limiting length for uncompensated lines if the voltage at two ends must be held at the following sets of values. Neglect resistance and assume no load condition. **4**

(a) $E_s = 400kV$. $E_r = 420kV$

(b) $E_s = 380kV$. $E_r = 420kV$.

What can be done to increases the limiting length ?

(c) A power of power of 2000MW is to be transmitted over distance of 800 km. Use 400 kV 3-Φ transmission line : Determine

(1) Suggest no of circuit required with 50% series capacitor compensation.

(2) % power loss in the line and efficiency of the line for transmission of this power.

(3) Transmitted and received reactive power at the maximum permission sending end and receiving end voltages with phase diference 30^o .

2 Determine for the 400kV horizontal 3-Φ transmission line : **15**

(i) Inductance matrix for untransposed line per km.

(ii) Inductance matrix for transposed line per km.

(iii) Positive, Negative and Zero sequence inductance and reactance per km for transposed configuration.

(iv) Eigen values of the inductance matrix for transposed line per km.

OR

2 Determine for the 400 kV horizontal 3-Φ transmission line : **15**

(i) Capacitance matrix for un transposed line per km.

(ii) Capacitance matrix for transposed line per km.

(iii) Positive, Negative and Zero sequence capacitance and reactance per km for transposed configuration.

(iv) Eigen values of the capacitance matrix for transposed line per km.

3 Attempt any **two** : **15**

(1) The following details are given for a 750 kV, 3-Φ line resistance r=0.014 Φ/km inductance l=0.866 mH/km, reactance x=0.272 ohm/km at 50 Hz C=12.82 nF/km giving a suceptance of y=4.0275 mH/km velocity=$_{3\times10}{}^{8}$ m/s line length = 500 km.

Calculate (a), (b) and (c) below :

(a) Fing impendance Z and admittance Y of transmission line.

(b) The generalized constants A, B, C and D in both polar and rectangular forms.

(c) Find surge impendance at no load Z_{oo}.

(2) Derive and expression for maximum charge condition on a 3-Φ line.

(3) Calculate the generalized constant (A_T, B_T, C_T, D_T) for a transmission line with shunt reactors at both ends and series capacitance in middle of line.

SECTION - II

4 (a) Answer the following questions in brief : **5**

(i) Why dc systems invariably use ground or sea as return ?

(ii) Why the voltage regulation is better in case of dc transmission ?

(iii) Why dc transmission is economical and preferable over ac transmission for large distance only ?

(iv) What is ferranti effect ?

(v) Can corona loss be ignored in the design of HVDC transmission lines ? Why ?

(b) Fill in the blanks with appropriate words : **5**

(i) A dc transmission line requires _____ at each end.

(ii) Back to Back HVDC is used to provide _____ interconnection.

(iii) A dc line carries _____ power than the ac line.

(iv) The dc transmission is mainly at _____ kV.

(v) One of the advantage of high voltage dc transmission is that there is no _____ effect.

(c) State and explain the application of DC transmission. **5**

(d) A bridge connected rectifier is fed from 238 kV/100kV transformer from 238 kV supply. Calculate the direct voltage output when the commutation angle is 20^o and delay angle (a) O^o (b) 30^o (c) 60^o. **5**

5 Attempt any **three** : **15**

(a) Derive the expression for dc output voltage of 3-phase rectifier with delay and overlap.

(b) List 3 dangerous conditions which give rise to SSR and all the counter measures taken to guard against them.

(c) Classify the type of HVDC links discuss the applications of each of these links.

(d) State the properties of field of point charge.

(e) Explain in detail about corona in HVDC lines.

6 Attempt any **two** : **15**

(a) Compare HVDC transmission and EHV-AC for long distance.

(b) Draw the circuit diagram of three phase bridge converter circuit suitably. Connectet to give 12 pulse DC output. Also explain the working of it.

(c) Explain different methods used in HVDC system for power how regulation.

(d) Write short note on skin effect and proximity effect.
