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10EE751

Seventh Semester B.E. Degree Examination, June/July 2017
HVDC Transmission

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. With suitable schematics, explain the constitution of HVAC and HVDC lines. **(10 Marks)**

b. Explain the different kinds of DC links, with relevant schematic diagrams. **(06 Marks)**

c. Mention the applications of HVDC transmission. **(04 Marks)**

2 a. Compare AC and Dc transmission with respect to economics and technical performance. **(08 Marks)**

b. Draw the schematic diagram of typical HVDC converter station and explain the various components. **(08 Marks)**

c. List out the advantages of HVDC transmission. **(04 Marks)**

3 a. With the help of a schematic diagram and waveforms, obtain the volt -- ampere ratings of valve, primary winding and secondary winding of a 1 – phase full bridge rectifier. **(10 Marks)**

b. Explain the choice of best circuit for HVDC converters and also write the formulas for direct output voltage and aggregate valve rating of the best circuit. **(10 Marks)**

4 a. Explain the 3 – phase one way rectifier with schematic diagram and waveforms. **(10 Marks)**

b. Draw the circuit diagrams for the following additional 6 – pulse converter circuits and give the comparison : **(06 Marks)**

i) Cascade of two three phase rectifiers ii) Six phase diametrical connection.

c. A three phase, 6 – pulse bridge rectifier is fed from a transformer with nominal voltage ratings of 220 KV/110 KV. If the secondary voltage is 110KV (rms), direct current is 2KA, ignition delay angle $\alpha = 0$ and overlap angle $\mu = 0$. Calculate the average output voltage and volt – ampere rating of the valve. **(04 Marks)**

PART – B

5 a. Derive the expression for average direct voltage of a 6 – pulse converter with a delay angle α and overlap angle of less than 60^0. **(10 Marks)**

b. Analyse the Graetz circuit with grid control but no overlap and also prove that $V_d = V_{do} \cos \alpha$. (V_d is average direct voltage and V_{do} is ideal no – load direct voltage) **(06 Marks)**

c. Draw the waveforms for 3 – phase bridge converter with $\alpha = 0^0, 60^0, 90^0$ and $\mu\ 0^0, 20^0, 60^0$. **(04 Marks)**

6 a. Explain the constant current versus constant voltage control of transmitted power. **(10 Marks)**

b. Explain the combination characteristics of rectifier and inverter. **(10 Marks)**

7 a. What are the desired features of CC control? Explain. **(10 Marks)**

b. Explain the stability of control by using a damping circuit. **(10 Marks)**

8 a. Enumerate the functions of smoothing reactor in case of HVDC transmission system. **(06 Marks)**

b. What are the detrimental effects of current oscillations? Explain how these oscillations are minimized using anode dampers. **(08 Marks)**

c. Find the inductance of the dc reactor required to prevent consequent commutation failure in the inverter described below :

No. of bridges per pole	:	2
Rated voltage per bridge	:	200KV
Rated current	:	1.80 KA.
I_{S2}	:	10.0 KA
Frequency	:	60Hz.

(06 Marks)

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