USN

06EE844

Eighth Semester B.E. Degree Examination, May/June 2010
HVDC Transmission

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Describe advantages and disadvantages of HVAC and HVDC power transmission systems for transmitting large bulks of power. **(10 Marks)**
b. Mention the applications and limitations of HVDC power transmission. **(06 Marks)**
c. With a neat sketch, explain merits and demerits of homopolar link. **(04 Marks)**

2 a. With the help of a single line diagram, explain the role of each component in a typical converter station. **(10 Marks)**
b. Derive an expression for
i) Value utilization for
ii) Transformer utilization factor for a six pulse Greatz circuit. **(10 Marks)**

3 a. Analyze the Greatz circuit without overlap and prove that $\cos\phi = \cos\alpha$, where $\cos\phi$ is input supply power factor and α is the firing angle delay, with assumptions made. **(12 Marks)**
b. A bridge converter is supplied by an input transformer and the details are as follows.
Output voltage per phase of transformer = 200 kV (rms)
Reactance per phase of transformer = 5%
Transformer power rating = 100 MVA
Firing angle α = 30°
Overlap angle u = 15°
Calculate the load current and terminal voltage on DC side. **(08 Marks)**

4 a. Discuss the merits and demerits of constant current versus constant voltage control of power in a HVDC system. **(06 Marks)**
b. List the desired features of HVDC link control. **(06 Marks)**
c. Write a note on constant minimum ignition angle control of HVDC system. **(08 Marks)**

PART – B

5 a. Enumerate the functions of smoothing reactor in case of HVDC transmission systems. **(06 Marks)**
b. Calculate the value of smoothing reactor for a HVDC system of rated voltage 100 kV and rated current 1250 KA. Assume S_i factor as 0.8. **(04 Marks)**
c. Explain stability of control by considering a damping circuit. **(10 Marks)**

6 a. With reference to HVDC converter control system bring out the limitations of manual control. **(05 Marks)**

b. What is the role of a power controller in a HVDC converter? Explain. **(05 Marks)**

c. Describe with the aid of V.I characteristics the meaning of 'mode ambiguity' and how it can be stabilized. **(10 Marks)**

7 a. Give the procedure of detecting line faults so as to ensure DC line protection. **(08 Marks)**

b. With the aid of a block diagram, explain Constant Extinction Angle (CEA) control of HVDC converter. **(07 Marks)**

c. Explain how current oscillations are minimized using anode dampers. **(05 Marks)**

8 Write explanatory notes on :

a. Starting and stopping of DC links

b. Current margin and its significance

c. Thyristor valve design

d. Choice of best circuit for HVDC converters. **(20 Marks)**

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