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EE834

### Eighth Semester B.E. Degree Examination, Dec.09/Jan.10
### HVDC Transmission

Time: 3 hrs.

Max. Marks:100

**Note: *Answer any FIVE full questions.***

1  a. Compare the ac and dc transmission systems based on their technical performance.
(08 Marks)
   b. What are the different configurations for dc interconnection? Which is the most economic configuration? (06 Marks)
   c. Explain the criteria to select the voltage level for long distance bulk power transmission.
(06 Marks)

2  a. Define valve utilisation factor and transformer utilization factor. Calculate these values when q = 3, r = 1 and s = 2. (08 Marks)
   b. Show that the reactive power consumed by the converter increases with the increase in the firing angle. (06 Marks)
   c. Draw the dc voltage waveforms of the Graetz circuit for firing angles $\alpha$ = 0, 30°, 60°, 90°, 120°, 150° and 180°. (06 Marks)

3  a. Explain the principle of dc link control with the help of equivalent circuit for two terminal dc link. (10 Marks)
   b. List the derived features of HVDC link control. (04 Marks)
   c. What is current margin? Why is current controller required at both rectifier and inverter stations. (06 Marks)

4  a. With usual notations show that the current on AC side of 12 pulse converter is given by

$$i_A = \frac{4\sqrt{3}Id}{\pi}\left[\cos wt - \frac{1}{11}\cos 11wt + \frac{1}{13}\cos 13wt - - - -\right].$$  (12 Marks)

   b. Define the different performance indices used to measure the telephone interference in case of filters. (08 Marks)

5  a. What is commutation failure? What are the effects of single commutation failure? (06 Marks)
   b. Describe the causes of over voltages in a converter station. (09 Marks)
   c. Draw the schematic diagram of the over voltage protection of converter station. (05 Marks)

6  a. List the main functions of smoothing reactor. (06 Marks)
   b. What are the three basic types of faults in converters? (06 Marks)
   c. Explain the basic concept of DC circuit interruption. (08 Marks)

7  a. What are the various tools available for the simulation of dynamic system? (04 Marks)
   b. Explain dynamic digital simulation of HVDC systems. Bring out its merits and demerits.
(08 Marks)
   c. Explain the HVDC converter model for dynamic analysis. (08 Marks)

8  Write short notes on :
   a. Modern trends in dc transmission
   b. Power control in HVDC transmission systems
   c. Non characteristic harmonics
   d. HVDC simulator (physical model). (20 Marks)

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