

Seventh Semester B.E. Degree Examination, Dec.2016/Jan.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. State the advantages of HVDC transmission. (06 Marks)
- b. With a neat sketch explain the HVDC links and why the bipolar line is more commonly used. (10 Marks)
- c. A single phase overhead AC line has inductance/km as 2mH and a capacitance of 0.125×10^{-7} f/km. Estimate the surge impedance loading of the line, when the system voltage is 400 KV. (04 Marks)
- 2 a. Compare AC and DC transmission on the basis of :
i) Economics of transmission ii) Technical performance iii) Reliability. (10 Marks)
- b. What are the limitations of HVDC power transmission? Explain how these limitations have been surmounted in modern HVDC lines. (10 Marks)
- 3 a. What are the advantages of using IGBTs over SCRs for HVDC converters? (06 Marks)
- b. Describe valve protection schemes. (10 Marks)
- c. What is a Graetz circuit? Why it is accepted as the best pulse converter configuration. (04 Marks)
- 4 a. Explain different types of valve tests. (10 Marks)
- b. Describe the recent trends and developments in HVDC valve technology. (10 Marks)

PART – B

- 5 a. Analyze the performance of Graetz circuit without overlap condition. Draw relevant waveforms. (14 Marks)
- b. A bridge connected rectifier is fed from 220KV/110 KV transformer with primary connected to 220 KV :
i) Determine the DC output voltage when the commutation angle is 15° and the delay angle is 0° (zero degree)
- ii) If the rectifier delivers 800 amps, determine the effective reactance/ phase for $\alpha = 30^\circ$, $E_{\ell\ell}$ (line secondary voltage of the rectifier transformer) is equal to 94.115 KV or $[E_{\ell\ell} = 94.115 \text{ KV}]$ and DC voltage, $V_d = 100 \text{ KV}$. (06 Marks)
- 6 a. Draw the ideal and actual control characteristics of rectifier and inverter and explain briefly. (10 Marks)
- b. Explain power reversal characteristics in a DC link. (10 Marks)
- 7 a. Explain any four functions of higher level controllers used in DC links. (10 Marks)
- b. Write short notes on :
i) Constant current control ii) Constant extinction angle control. (10 Marks)
- 8 a. Explain the functions of smoothing reactor. (06 Marks)
- b. What are the causes of over-voltages in a converter station? What are the basic principles of over-voltage protection? (14 Marks)

* * * * *