

**Code No: 52202/MT**

**M.Tech. II-Semester Examinations, July/August-2006.**

**HVDC TRANSMISSION**

**(Common to Power Electronics and Electric Drives, Power and Industrial Drives and Electrical Power Systems)**

**Time: 3 hours**

**Max. Marks: 60**

**Answer any FIVE questions  
All questions carry equal marks**

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1. Discuss the economic advantages of HVDC transmission over EHVAC link for transmitting bulk powers from point to point based on Insulation requirements and stability.
2. With the help of neat schematic diagram explain the operation of 3-Phase, 6 Pulse Graetz's circuit. Also estimate the following for the above converter circuit interms of circuit parameters and firing angle. Neglect the reactance of the circuit.
  - a) Out put Voltage
  - b) R.M.S current of the Valve
  - c) Transformer Volt-ampere rating
3. With neat diagram explain the operation of 3-Phase, 6 Pulse, diametrical connection and sketch the waveforms to scale of the following items with firing angle  $\alpha = 30^\circ$  and  $\mu = 0$ 
  - a) out put voltage
  - b) current wave forms and
  - c) valve voltage.
4. Develop the equivalent circuit of a converter working as rectifier with delay angle ' $\alpha$ ' and overlap angle ' $\mu$ ' and hence obtain the equivalent resistance of the converter.
- 5.a) Explain step by step what are the various essential controls that are required for the stable operation of HVDC link.
  - b) Explain the limitations of constant ' $\beta$ ' control of inverter operation when these is a sudden either symmetrical or asymmetrical reduction in system voltage.
- 6.a) Explain the purpose of smoothing reactor in a d.c line.
  - b) Substantiate the necessity of compounding of inverter station with constant current control in addition to constant extinction angle control.
7. What do you understand by "characteristic harmonics" in HVDC system? Using Fourier analysis, obtain an expression for  $n^{\text{th}}$  harmonic voltage on the D.C. side of the converter system. Discuss the effect of variation of ' $\alpha$ ' and ' $\mu$ ' on the magnitude of the above parameters.
8. Write short note on the following:
  - a) Multi-terminal systems
  - b) Over-voltages on the HVDC system
  - c) By-pass valve and its use.

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