

**Eighth Semester B.E. Degree Examination, Dec.08 / Jan.09**

**HVDC Transmission**

Time: 3 hrs.

Max. Marks:100

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

- 1 a. Discuss the relative merits of the two modes of transmission, which need to be considered by a system planner. (10 Marks)
- b. Enumerate the important applications of DC transmission. (04 Marks)
- c. Explain the procedure of planning DC alternative considering the specific applications. (06 Marks)
- 2 a. Define pulse number and its importance in selecting a best suitable converter configuration. (05 Marks)
- b. A Graetz circuit is supplied from a three phase 230 V, 60 Hz supply. The load current is continuous and has negligible ripple. If the average load current  $I_{dc} = 150A$  and the commutating inductance of 0.1 mH determine the overlap angle when  $\alpha = \frac{\pi}{6}$  and the DC power delivered. (08 Marks)
- c. Show how selection of voltage level minimizes the total costs for a given power level. (07 Marks)
- 3 a. Neglecting the losses show that  $\cos\phi = \cos\alpha$  for a converter circuit without overlap, where  $\cos\phi =$  Displacement or vector power factor. (07 Marks)
- b. Explain the basic means of converter control with the aid of steady state equivalent circuit diagram. (08 Marks)
- c. Describe the limitations of manual control and the need of automatic control. (05 Marks)
- 4 a. With reference to HVDC converter control system explain,
  - i) Constant current control.
  - ii) Constant extinction angle control. (10 Marks)
- b. Sketch the different types of MTDC systems and give the comparison between series and parallel MTDC systems. (10 Marks)
- 5 a. With regard to converter faults explain,
  - i) Commutation failure.
  - ii) Arc through
  - iii) Misfire (09 Marks)
- b. Write the basic principle and procedure of over current protection in a pole. (07 Marks)
- c. A circuit breaker used to interrupt a DC line has the following parameters:  
 Current in the breaker prior to interruption = 250 A.  
 System voltage = 1000 V  
 Breaker counter emf = 2 kV  
 Line inductance = 500 mH  
 Calculate the energy absorbed by the breaker. (04 Marks)
- 6 a. Explain the causes of over voltages in a converter station. (09 Marks)
- b. State the principles of over voltages protection. (04 Marks)
- c. Discuss the troubles caused by harmonics. (07 Marks)
- 7 a. Discuss the problems that can be studied using DC simulators. (07 Marks)
- b. What are the requirements of a good simulation tool? (06 Marks)
- c. Bring out the merits and demerits of digital dynamic simulation. (07 Marks)
- 8 Write explanatory notes on:
  - a. Surge arrestors.
  - b. Harmonic filters.
  - c. Basic firing schemes of HVDC converters. (20 Marks)
  - d. Parity simulators.