

Roll No.....

Total No. of Printed Pages: 1

Total No. of Questions: [09]

B. Tech EE (Semester – 6th)
HVDC TRANSMISSION SYSTEMS
Subject Code: BELED1622
Paper ID: 18111536

Time: 03 Hours

Maximum Marks: 60

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A

(2 marks each)

Q1. Attempt the following:

- a) Name the different types of DC link?
- b) State the two comparison of AC & DC transmission system?
- c) What is firing angle?
- d) Define the terms overlap and overlap angle in converters for HVDC Transmission.
- e) Define - Valve Rating
- f) What is meant by pulse number of a converter?
- g) What is the need of smoothing reactor?
- h) Draw the schematic diagram of Graetz bridge circuit
- i) What is DC breaker? How it will be useful?
- j) Mention voltage stability problem in AC/DC systems.

Section – B

(5 marks each)

- Q2. Give the comparison between AC and DC Transmission and explain the factors in detail?
- Q3. Why the use of 12 pulse converter is preferable over the six pulses and increase in pulse number beyond 12 is not practical.
- Q4. Discuss system control hierarchy for a HVDC-link and explain firing Angle control in HVDC valves.
- Q5. A Graetz Bridge operates with a delay angle of 15° . The leakage reactance of the transformer is 10 ohms. The line to line AC voltage is 85 kV. Compute overlap angle and DC voltage for (i) $I_d=2000\text{A}$ and (ii) $I_d=4500\text{ A}$.
- Q6. Give the comparison between series and parallel MTDC systems.

Section – C

(10 marks each)

- Q7. A Monopolar HVDC link has one bridge at each terminal. The parameters of the link are: $\sigma_{\min}=5^\circ$, $\gamma_{\min}=18^\circ$, $R_d=5\text{ ohms}$, $R_{cr}=10\text{ ohms}$, $R_{ci}=12\text{ohms}$, $V_{dor}=115\text{kV}$, I_{ref} at rectifier= 1kA , I_{ref} at inverter= 900A
 - (a) If $V_{doi}=117.5\text{kV}$, Calculate $I_{d,}$, α , γ , P_i and Q_i
 - (b) Repeat (a) if $V_{doi}=120\text{kV}$
- Q8. (a) Describe constant extinction angle control and constant current control?
(b) Distinguish between characteristics and non-characteristics harmonics in HVDC converters.
- Q9. Write a short note on:
 - (a) Smoothing Reactors
 - (b) Synchronous and Asynchronous links