Roll No…….. **Total No. of Printed Pages: 1**

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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. Discus 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 15^0 .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=2000A and (ii) I_d=4500 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: $\sigma_{min}=5^o$, $\gamma_{min}=18^o$, R_d=5 ohms, R_{cr}=10 ohms, R_{ci}=12ohms,V_{dor}=115kV, I_{ref} at rectifier=1kA, I_{ref} at inverter=900A

(a) If V_{doi}=117.5kV, Calculate I_d,, α, γ, P_i and Q_i
(b) Repeat (a) if V_{doi}=120kV

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