USN ☐☐☐☐☐☐☐☐☐☐   **10EE751**

Seventh Semester B.E. Degree Examination, June/July 2019
HVDC Transmission

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. With suitable schematics, explain the constitution of EHV AC and DC lines.   **(10 Marks)**
   b. i) List any four advantages and disadvantages of HVDC transmission system.
       ii) Mention any two applications of HVDC transmission.   **(10 Marks)**

2 a. Compare the HVAC and HVDC transmission for economics of operation, stability limit, voltage control and reliability.   **(12 Marks)**
   b. With a neat diagram, explain the different kinds of HVDC links.   **(08 Marks)**

3 a. What are the assumptions made while studying the properties of converter circuits?
                                                                                            (03 Marks)
   b. Explain the six-phase diametrical rectifier circuit.   **(05 Marks)**
   c. Describe the $1 - \phi$ full wave rectifier with waveform and obtain the PIV, pulse number, average value of voltage, aggregate VA rating of valves.   **(12 Marks)**

4 a. Explain the three phase one way rectifier circuit with waveform and obtain
       i)   Average direct voltage
       ii) PIV
       iii) Aggregate VA rating of valves
       iv) VA rating of transformer primary and secondary winding.   **(12 Marks)**
   b. "Best converter circuit for the HVDC transmission is 3 phase bridge". Justify the statement by explaining the advantages of a 3-phase bridge configuration.   **(08 Marks)**

PART – B

5 a. With relevant figures and waveforms, explain the operation of Graetz bridge circuit. Derive the expression for average DC output voltage of convertor without overlap.   **(10 Marks)**
   b. Derive the expression for average direct voltage of a six pulse converter with a delay angle of 'α' and overlap angle of less than 60°.   **(10 Marks)**

6 a. Draw the electrical equivalent circuit of a HVDC link and explain the basic principles of controlling the voltage of any point on the line and the current. Also explain the reversal of power.   **(10 Marks)**
   b. Discuss the actual control characteristics of converter. In this context, explain the significance of current margin and its ranges.   **(10 Marks)**

7 a. Explain the stability of control as considering a damping circuit.   **(10 Marks)**
   b. Explain the constant current control in HVDC converter stations.   **(10 Marks)**

8 a. Enumerate the functions of smoothing reactor in case of HVDC transmission systems.
                                                                                            (06 Marks)
   b. Explain the causes of oscillations on DC lines.   **(06 Marks)**
   c. Explain how current oscillations are minimized using anode dampers.   **(08 Marks)**

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