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**P.E.S. College of Engineering, Mandya - 571 401**  
 (An Autonomous Institution affiliated to VTU, Belagavi)  
**Eighth Semester, B.E. – Electrical and Electronics Engineering**  
**Semester End Examination; May/June - 2018**  
**HVDC Power Transmission**

Time: 3 hrs

Max. Marks: 100

*Note: Answer FIVE full questions, selecting ONE full question from each unit.*

**UNIT - I**

- 1 a. Compare AC and DC Transmission based on their Economics, Technical Performance and Reliability. 10
- b. Mention any five disadvantages of DC Transmission. 5
- c. Mention the important Applications of DC Transmission. 5
- 2 a. Explain different types of DC link configurations in HVDC Transmission. 10
- b. Draw the schematic diagram of a typical HVDC converter station and explain the various components. 10

**UNIT - II**

- 3 a. With a neat circuit diagram and waveforms, explain single phase full wave rectifier circuit and find  $V_d$ ? 10
- b. With neat sketch explain the VI - characteristics of a thyristor valve. 10
- 4 a. With a neat circuit diagram and waveforms, explain three phase one way rectifier circuit and derive an expression for  $V_d$ ? 15
- b. List out the assumptions made for the analysis of bridge circuit. 5

**UNIT - III**

- 5 a. Explain the simplified analysis of Gratez circuit without ignition delay and without overlap. Derive expression for  $V_{d0}$  with related waveforms. 15
- b. What is overlap? Explain the effect of commutation overlap on average DC voltage. 5
- 6 a. Explain the simplified analysis of Gratez circuit with ignition delay " $\alpha$ " and without overlap. Derive an expression for  $V_d$  with related waveforms. 15
- b. For a 12 pulse converter with  $q = 4$ ,  $s = 3$ ,  $r = 1$ . Calculate the maximum DC power and transformer ratings (voltage winding), if PIV rating of the value is "V" and the rms current rating is "I". 5

**UNIT - IV**

- 7 a. Draw and explain the basic means of control for HVDC system. 10
- b. Draw and explain the Actual Converter control study state characteristics. 10

- 8 a. Explain the regions of mode ambiguity and stating the modified V-I characteristic for mode stabilization. 10
- b. Explain MTDC Network configurations involved in HVDC system. 10

**UNIT - V**

- 9 a. Explain the faults due to malfunctions of valves and controllers in HVDC system. 10
- b. With neat sketch, explain an over current protection scheme in a pole in HVDC system. 10
- 10 a. Distinguish between characteristics and Non-characteristics harmonics in HVDC system. 10
- b. List out the troubles caused by harmonics and explain single tuned, Damped and C type high pass filter with neat sketch. 10

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