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**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**  
**M.E. I Year (EEE) I-Semester (Make Up) Examinations, March-2016**  
**(Power Systems & Power Electronics)**

**High Voltage DC Transmission**

Time: 3 hours

Max. Marks: 70

*Note: Answer ALL questions in Part-A and any FIVE questions from Part-B*

**Part-A (10 X 2=20 Marks)**

1. What are the types of DC links?
2. Explain the term short circuit ratio.
3. Write the equation of harmonic distortion.
4. Explain the drawbacks of IPC scheme.
5. What are the methods to control over voltages on DC system?
6. Draw the equivalent circuit of DC insulator string.
7. Draw the locus of power curve of a converter in  $P_d$ -  $Q_d$  plane.
8. Why reactive power sources are needed in HVDC system?
9. List out the advantages of MTDC systems.
10. What are different types of MTDC systems?

**Part-B (5 X 10=50 Marks)**  
**(All bits carry equal marks)**

11. a) State and explain the advantages and disadvantages of dc transmission system with respect to economics, reliability, stability and performance.  
 b) A monopolar HVDC link has one bridge at each terminal. The parameters of the link are  $\alpha_{min} = 5^\circ$ ,  $\gamma_{min} = 18^\circ$ ,  $R_d = 5\Omega$ ,  $R_{cr} = 10\Omega$ ,  $R_{ci} = 12\Omega$ ,  $V_{dor} = 115KV$ ,  $I_{ref}$  at the rectifier = 1KA,  $I_{ref}$  at the inverter = 900 A. If  $V_{doi} = 1117.5KV$ , Calculate  $I_d$ ,  $\alpha$ ,  $\gamma$ ,  $P_i$  and  $Q_i$ .
12. a) Explain the causes and elimination methods of non-characteristics harmonics.  
 b) Illustrate the Equidistance Pulse Control (EPC) by any two methods.
13. a) What are the causes for over voltages in DC systems? Discuss their effects.  
 b) Explain arc extinguishing method in DCCB.
14. a) Explain the torsional interactions in case of HVDC systems.  
 a) Explain briefly conventional control strategies of reactive power control in HVDC.
15. a) Discuss the operation and control of MTDC systems.  
 b) Draw and explain the block diagram of 4-terminal current order model in MTDC system.
16. a) Explain briefly the modern trends in HVDC system.  
 b) Discuss the extinction angle control in case of HVDC transmission system.
17. Write short notes on any **two** of the following:
  - a) Harmonic over voltages excited by AC disturbances
  - b) Harmonic interaction with HVDC system
  - c) Compact converter stations

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