**EASWARI ENGINEERING COLLEGE**

**M.E (POWER ELECTRONICS AND DRIVES)**

**PS7005/ HIGH VOLTAGE DIRECT CURRENT TRANSMISSION**

**QUESTION BANK**

**TWO MARKS**

**Chapter 1**

1. **Define the term short circuit ratio.**
2. **Give the schematic representation of different configuration of asynchronous interconnection**
3. **State the main criteria to go for HVDC transmission.**
4. **List the types of DC links.**
5. **Define the two measures of overall system reliability.**
6. **Name the 3 possible configurations of interconnections.**
7. **List the types of applications for which HVDC are used.**
8. **List four major disadvantages of HVDC transmission.**
9. **Distinguish between characteristics harmonics and non-characteristic harmonics**
10. **Discuss filter carrier frequency.**

**Chapter 2**

1. **Draw and explain what do you understand by current margin.**
2. **Show that converters (rectifier and inverter) consume reactive power.**
3. **What is meant by commutation group.**
4. **Why the use of 12 pulse converter is preferable over the six pulses and increase in pulse number beyond 12 is not practical.**
5. **Describe the three mode of converter**
6. **State the assumption made in the analysis of converters**
7. **Define pulse number**
8. **Explain the principle of DC link control**
9. **State the reasons why feedback control of power in DC link is not desirable.**
10. **Define characteristics and non – characteristics harmonics in HVDC system**

**Chapter 3**

1. **What are the potential applications of MTDC systems?**
2. **What are the typical problems considered for study of MTDC systems?**
3. **What are the two basic requirements for the firing pulse generation of HVDC values?**
4. **What is meant by start up of DC link with long pulse firing?**
5. **Discuss the role of converter transformer in a HVDC link.**
6. **Explain “ Back to Back” and “ point to point “ HVDC links.**
7. **State the drawbacks of EPC scheme.**
8. **Name a few high level controllers used in HVDC systems.**
9. **What is constant –current control and constant firing angle control?**
10. **List the advantages of MTDC systems.**

**Chapter 4**

1. **What are the basic considerations in representation of the DC systems?**
2. **Define per unit system for DC quantities.**
3. **State the problems associated with the injection of harmonics in the system.**
4. **State the criteria under which the effectiveness of DC filter is judged.**
5. **What is the significance of power flow analysis?**
6. **What are the equations used for corrections to the bus voltage estimation in fast decoupled load flow method?**
7. **Define harmonics distortion and telephone harmonic form factor.**
8. **What are the effects of carrier frequency and RI noise?**
9. **Explain how DC power is reversed in HVDC link.**
10. **Draw na explain VDCL characteristics.**

**Chapter 5**

1. **Draw the physical model of HVDC simulator.**
2. **What are the disadvantages of dynamic simulation?**
3. **List the tools that employed for the simulation of dynamic systems.**
4. **Draw the EMTP model of a valve with mathematical relation.**
5. **List the advantages of HVDC system simulation.**
6. **What are the applications of HVDC systems simulation?**
7. **What are the requirements of a good simulation tool?**
8. **List the studies that can be carried out using simulation.**
9. **Discuss why γmin is maintained in inverters**.
10. **Explain the different modes of converter controls.**

**16 MARKS**

**UNIT-1**

1. **Compare AC and DC transmission system based on Economic aspects, technical performance and reliability?**
2. **With a neat sketch discuss different types of HVDC links? And explain modern trends in DC transmission.**
3. **Discuss the function of various components in a converter station.**
4. **With a neat sketch explain the different types of DC links used in DC transmission systems.**
5. **What are the disadvantages of DC transmission? How are they overcome recently.**
6. **Describe the major components of HVDC transmission.**
7. **What are the modern trends in Dc transmission? Explain.**
8. **Compare the HVDC transmission with EHVAC transmission in the following aspects, if bulk power is transmitted over a long distance.**
	1. **Economics of power transmission.**
	2. **Technical performance and**
	3. **Reliability.**
9. **Explain the technological development in control and protection, for better performance and reliability of a dc transmission system.**
10. **Explain how the economic choice of voltage level is selected for a fixed power transfer in dc transmission system.**

**UNIT-2**

1. **With a neat sketch explain the characteristics of 12 pulse converter.**
2. **Enumerate the effect of firing angle with angle of overlap and coupling factor for different mode of operation in rectification.**
3. **Draw a 12 pulse converter unit with source reactance included and explain the 12 pulse converter characteristics.**
4. **Explain the basic principles of dc link control with neat diagram of the steady state equivalent circuit of a 2-terminal dc link and the schematic diagram.**
5. **Explain hierarchical control structure for a HVDC link.**
6. **Discuss the various firing angle control schemes used in HVDC valves. Also give the advantages and drawbacks of each scheme.**
7. **Mention the reasons for harmonics arising in HVDC system.**
8. **Using Fourier analysis, obtain an expression for nth harmonics voltage on the DC side of the converter system. Discuss the effect of variation of DC voltage harmonics with the overlap angle.**
9. **Show the variations of harmonic current on the AC side of the converter for varying valves of converter angle ‘α’ and overlap angle ‘µ’.**
10. **Explain the analysis of simplified Graetz circuit with overlap two for and three value conduction mode.**
11. **Explain the converter bridge characteristics as rectifier and as inverter.**
12. **With a neat sketch explain operation of a twelve pulse converter HVDC link. And derive the expression for the equivalent circuit for the rectifier and inverter.**
13. **List out different components of point-to-point HVDC link and give the schematic arrangement.**
14. **A 3 phase bridge inverter has a commutating reactance of 150 ohms. The current on a dc side is 1050 amps and voltage 286 kV. The AC line voltage is 345 kV. Calculate the extinction angle and Overlap angle?**

**UNIT-3**

1. **With a neat sketch explain,**
	1. **Individual phase control and**
	2. **Equidistance pulse control schemes.**
2. **Draw the block diagram of the hierarchical control for the HVDC link and explain.**
3. **Explain the Equidistant pulse control and drawbacks of EPC scheme.**
4. **Explain the converter control characteristics and the modification of the control characteristics.**
5. **Explain the constant voltage parallelth scheme and the control current series scheme connection with illustration for multi terminal HVDC systems.**
6. **Draw the schematic diagram and explain the control characteristics of parallel connected MTDC systems and series- connected systems.**
7. **Explain the types of MTDC system in detail.**
8. **compare the advantage and disadvantages of series and parallel MTDC systems.**
9. **Explain what are the modifications in incorporated to the basic current margin method to improve the control operation of MTDC systems.**
10. **Feedback control of power in a DC link is not desirable. Justify.**
11. **Describe with neat sketches the different firing angle control used in HVDC system.**

**UNIT-4**

1. **Describe the design tuned filter with their configuration and impedance characteristics.**
2. **Explain the effect of firing angle error and unbalanced voltage in the non-characteristics harmonics.**
3. **Express the representation for power flow solution and explain how power flow analysis requires AC/DC interface at the HT bus with illustrations.**
4. **Draw and explain the functional block diagram of an HVDC system model.**
5. **Derive the mathematical models of a dc network. Dc converter and converter controller in the power flow analysis.**
6. **Write a note on ‘solution of Dc load flow’.**
7. **Discuss the solution methodology of AC-Dc power flow. Also give the comparison between these methods.**
8. **Explain the characteristics of the harmonics? And derive an expression for harmonic voltages and current for 12 pulse converter unit?**
9. **Explain with a neat sketch filters used in HVDC link and discuss design of AC filters?**
10. **Describe the effects of characteristics harmonics and non characteristics harmonics.**
11. **Explain the design procedure for single tuned AC filter.**

**UNIT 5**

1. **Explain simulation of HVDC systems?**
2. **Explain modeling of HVDC system for digital dynamic simulation?**
3. **With the help of the schematic diagram explain the physical model of a HVDC system simulator. List the applications and advantages of simulators**
4. **Draw and explain the modeling of HVDC systems for digital dynamic simulation and its advantages. What is the role of parity simulator?**
5. **Give a brief note on philosophy and tools of HVDC system simulation.**
6. **What is digital simulation? Write short notes on digital dynamic simulation.**
7. **What are the problems that can be studied using DC simulation? Explain.**
8. **How can a valve and converter be modeled in a simulation?**
9. **Using graph theories derive the time varying equivalent model of a three phase bridge converter for possible number of modes of operation.**
10. **Explain how lumped inductor, capacitor and a lossless transmission line are modeled in EMTP.**
11. **Derive the equivalent circuits of a lossless bipolar DC line with mutual coupling using modal analysis.**