

Code No: 07A70204

R07**Set No. 2****IV B.Tech I Semester Examinations, November 2010****HVDC TRANSMISSION****Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions****All Questions carry equal marks**

1. (a) List out problems associated with the injection of harmonics both on AC and DC side of HVDC link.
(b) Write short notes on methods of reducing harmonics in HVDC system. [8+8]
2. (a) What is meant by firing angle delay and commutation delay? Give the wave forms of voltage and current in a 6 pulse Graetz circuit with $\alpha = 30^\circ$ and $\mu = 15^\circ$.
(b) Explain how a converter with Grid/Gate control can be operated both as a rectifier and inverter. [8+8]
3. (a) Explain the break even distance of D.C transmission system. Give its range of values for D.C transmission lines.
(b) Explain briefly about different types of HVDC links. [8+8]
4. What are the various sources of harmonics generation in a HVDC line? Describe how a double tuned filter can be designed for a HVDC system. [16]
5. (a) Explain about Individual Phase Control scheme for firing angle control employed in a converter. Also explain about its drawbacks.
(b) Explain the operation of a DC link, under following cases: Assume relevant control characteristics for the converters. [16]

Case	Converter 1	Converter 2
(i)	Rectifier	Inverter
(ii)	Inverter	Rectifier
6. Draw the schematic of a HVDC line presently being used in our country and provide a suitable model for the same. [16]
7. Write a short notes on:
 - (a) Alternate control strategy for
 - i. rectifier and
 - ii. inverter
 - (b) Advantages and disadvantages of synchronous condensers
 - (c) Variable impedance Type SVs. [16]
8. (a) Draw the schematic diagram indicating the arrangement of surge arresters in a converter station. Explain how their disruptive capabilities vary with respect to the location.

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- (b) Explain in detail about the surge arrestors used in HVDC transmission system.
[8+8]

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R07**Set No. 4****IV B.Tech I Semester Examinations, November 2010****HVDC TRANSMISSION****Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80**

Answer any FIVE Questions
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1. (a) Obtain a relation between firing angle and power factor angle in a three phase bridge rectifier.
(b) What is commutating resistance, explain? [8+8]
2. (a) Explain the causes of reactive power absorbed by HVDC converter substation.
(b) With a neat sketch, explain about Thyristor controlled Reactor. [8+8]
3. What do you understand by modeling of a system network? How do you model a HVDC link? [16]
4. (a) Explain briefly about different types of HVDC links.
(b) Compare the HVDC transmission HVAC transmission with reference to following factors:
 - i. Economics
 - ii. Technical performance
 - iii. Reliability. [8+8]
5. (a) Draw and explain the combined characteristic of rectifier and inverter.
(b) With a suitable circuit, explain the operation of constant current regulator. [8+8]
6. With the aid of schematic diagram explain in detail the protection against over-currents in HVDC converters. [16]
7. What are the factors which help in deciding the number of pulse converters used in a system? Classify them as economic, technical and describe them. [16]
8. Mention the configurations and impedance characteristics of various types of filters. Give design aspects of single tuned filter. [16]

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R07**Set No. 1****IV B.Tech I Semester Examinations, November 2010****HVDC TRANSMISSION****Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80**

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1. Derive an equation for harmonic voltage and current for single tuned filter and discuss the influence of network admittance on design aspects. [16]
2. State the corona phenomenon in HVDC line. Explain in detail the effects of corona on DC line. [16]
3. (a) Mention the merits and demerits of mercury-arc bridges and solid state bridges.
 (b) Is HVDC transmission system being used in our country? If yes, where and what are the brief technical parameters? [8+8]
4. (a) Classify the solution methodology for AC-DC load flow and explain.
 (b) Explain the per unit system for DC quantities. [8+8]
5. Why are harmonics generated in HVDC converter and what are the problems associated with the harmonics. Suggest some remedial measures. [16]
6. (a) With the help of a neat schematic diagram, explain the operation of three phase, $\sin$ pulse, Graetz's circuit when operating with a firing angle of $\alpha=30^\circ$. Neglect the reactance of the converter transformer.
 (b) Draw the following wave forms to scale when working as a rectifier:
 - i. Out put DC voltage
 - ii. Valve currents
 - iii. Voltage across valves.
 Hence, estimate the average D.C Voltage on the out put side. [16]
7. What are the advantages of a TSC and a fixed capacitor? Give the schematic of a single phase TSC and illustrate the loss comparison between FC/TCR and TSC/TCR. [16]
8. (a) Mention the basic requirements of control philosophy adopted in HVDC systems.
 (b) Explain the operation of phase-locked oscillator used in pulse-phase control. [8+8]

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R07**Set No. 3****IV B.Tech I Semester Examinations, November 2010****HVDC TRANSMISSION****Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions****All Questions carry equal marks**

1. (a) What is the condition for minimum reactive power requirement of a DC link under normal conditions?
(b) What are the alternate reactive power control strategies? [8+8]
2. What do you understand by Harmonics? Explain how many types of Harmonics can be present in a HVDC system? [16]
3. (a) List out the conditions for detection of DC line faults, also explain the criteria for choosing these parameters.
(b) Explain the major problems associated with DC breakers which doesn't exist in AC breakers. [8+8]
4. (a) Derive the mathematical model of d.c. link controllers of a d.c. link.
(b) Write the mathematical model of a d.c. converter. [8+8]
5. (a) How does energization and deenergisation of a bridge takes place?
(b) Explain about power control and power transversal. [8+8]
6. (a) Draw the schematic diagram of a 3 phase bridge (Graetz) circuit and explain its operation. Show that the Peak Inverse Voltage of the valve is $1.047 V_d$.
(b) The A.C line voltage of a 3 phase bridge rectifier is 150 KV when delivering a D.C. power of 200 MW. Assuming a delay angle of 20° and commutating reactance of 20 ohms, find the current on the D.C side of the converter. [8+8]
7. (a) Discuss the modern trends in HVDC transmission.
(b) What are the advantages of HVDC system over AC system? [8+8]
8. While listing out the problems associated with the injection of harmonics in a system, explain what is the major design objective of AC filters? How is their performance measured? [16]
