

IV B.Tech I Semester Regular Examinations, November - 2016

HVAC & DC TRANSMISSION

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

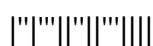
*Question paper consists of Part-A and Part-B**Answer ALL sub questions from Part-A**Answer any THREE questions from Part-B*

PART-A (22 Marks)

1. a) List the advantages and problems associated with EHVAC transmission? [4]
- b) What are the reasons for the production of Radio interference and audible noise on over head EHV AC transmission lines? [4]
- c) List the differences between HVDC and HVAC transmission? [3]
- d) Explain the principle of dc link control? [4]
- e) What are types of filters that are designed to filter the harmonics in HVDC transmission, give brief description about them? [4]
- f) Define Characteristic and non characteristic harmonics? [3]

PART-B (3x16 = 48 Marks)

2. a) Briefly explain about power handling capacity of A.C transmission lines and line losses? [8]
- b) Write about the properties of Bundled conductors used in EHV AC transmission lines? [8]
3. a) Draw and explain the block diagram of micro phones used in measuring the audible noise? [8]
- b) Discuss about different types of weighting networks and also draw the frequency response of A, B, D and A, D networks? [8]
4. a) Sketch the schematic diagram of a typical HVDC transmission system by representing the each component used in it? [8]
- b) Explain how the modern technology used in HVDC transmission system improves the reliability and performance of it? [8]
5. a) Explain the operation of six pulse converter bridge with neat diagram? [8]
- b) Discuss about various Equidistant Pulse Control schemes in detail? [8]
6. a) Briefly explain how the reactive power is provided using SVC and STATCOM? [8]
- b) Explain when alternate converter control strategies can be adopted for HVDC transmission system and also draw their characteristics with description? [8]
7. a) Design the single frequency tuned filters and double frequency tuned filters? [8]
- b) Explain different types of AC filters that are available for the elimination of harmonics? [8]



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PART-A(22 Marks)

1. a) Write the equation for resistance of conductor of EHV AC Transmission line and also state different effects of resistance of conductor? [3]
- b) Give the formulae for Corona loss based on voltages and voltage gradients? [4]
- c) State any four areas in which HVDC transmission system is used and explain them? [4]
- d) Explain the operation of Graetz bridge with neat sketch? [4]
- e) Define forced commutation? Why it is used and how it is implemented in HVDC transmission system and also state where it is adopted? [4]
- f) Name the means by which the harmonics developed in DC and AC waveforms are minimized? [3]

PART-B(3x16 = 48 Marks)

2. a) Derive the expression for charge and potential relations for multi conductors? [8]
- b) Draw the schematic of a very long EHV-AC transmission system and also explain about each part of it? [8]
3. a) What is excitation function? Why it is used and develop an equation for total energy received at a point on a line due to all sources? [8]
- b) Explain the working and purpose of Radio Noise Meter with the help of neat sketch? [8]
4. a) Compare the AC and DC modes of transmission? [8]
- b) Discuss about different factors that are considered while planning for HVDC transmission? [8]
5. a) Briefly explain what is meant by starting and stopping of a DC link? [8]
- b) Plot the converter control characteristics and write their significance? [8]
6. a) i) A back to back HVDC link with one bridge at each end is transmitting 100 MW with $V_d=100\text{kv}$. If $\alpha=15^\circ$, $\gamma=18^\circ$. Find V_{dor} , V_{doi} , Q_r and Q_i . Assume $R_{cr}=R_{ci}=12\Omega$.
ii) If the DC link is controlled such that Q_i is kept at the value earlier. Then find V_d , I_d , Q_r , α and γ ? [8]
- b) Compare SVC and STATCOM? [8]
7. a) Discuss about characteristic harmonics in detail? [8]
- b) Discuss about Non characteristic harmonics in detail? [8]



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PART-A(22 Marks)

1. a) Explain the necessity of EHVAC transmission and also write its applications? [4]
- b) Explain when the audible noise is generated by the EHV AC transmission lines and also draw the audible noise frequency spectra from A.C lines? [4]
- c) Give some reasons why HVDC system is selected as an alternative to EHV AC transmission system? [3]
- d) What is meant by firing angle control? Also mention the two basic requirements for the firing pulse generation of HVDC valves? [4]
- e) Sketch and explain the characteristics which shows the variation of I_d , V_d and α with P_d for constant reactive power? [4]
- f) State the harmful effects of AC and DC harmonics? [3]

PART-B(3x16 = 48 Marks)

2. a) Write the different special features and technical considerations for EHVAC lines? [8]
- b) Give the brief description about mechanical considerations taken into account for EHV AC lines? [8]
3. a) Explain about the propagation of RI waves by conduction, radiation and magnetic induction? [8]
- b) Derive the expression $P_c = (1/2)KC[V_m^2 - V_0^2]$ for the energy loss from the charge voltage diagram? [8]
4. a) With the help of neat diagrams explain the different types of HVDC links? [8]
- b) Draw and explain the different configurations used for asynchronous interconnection? [8]
5. a) Briefly write about the current and extinction angle control scheme used for HVDC transmission system? [8]
- b) Explain the operation of 3-phase 12 pulse converter bridge with neat diagram? [8]
6. a) Plot the characteristics which show the variation of Reactive power as a function of active power and also develop the equations for them? [8]
- b) Explain how the reactive power is provided by using AC filters and synchronous condensers also mention their advantages? [8]
7. a) What is the main objective in the design of AC filters and how it can be measured using different performance indices? [8]
- b) Write the effects of Non-Characteristic harmonics in detail? [8]

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PART-A(22 Marks)

1. a) Explain the necessity of EHVAC transmission and also write its applications? [4]
- b) List out the factors responsible for the generation of audible noise by a transmission line? Also write the names of objectionable disturbances caused in over head EHV AC transmission line? [4]
- c) What are the main objectives of using modern technology in HVDC transmission system? [3]
- d) Write the advantages of converter control and system control of HVDC transmission system? [4]
- e) List out the sources available to meet reactive power requirements of converters in HVDC transmission system? [4]
- f) Explain the design procedure for High Pass filters? [3]

PART-B(3x16 = 48 Marks)

2. a) What are the economic and technical considerations while selecting the voltage for EHV AC transmission lines? [8]
- b) Define the following terms related with EHVAC transmission system and also give the standard rated voltages for EHVAC transmission system?
 i) multiple conductors ii) single circuit line iii) double circuit line iv) electrical line [8]
3. a) Draw and explain the circuit used for measuring the Radio Influence Voltage? [8]
- b) Explain how the excitation function is measured by using different cage setups with the help of measuring circuit? [8]
4. a) Write the several advantages of a VSC based HVDC links over classical HVDC links? [8]
- b) Draw and explain the schematic of a single line diagram of a VSC based HVDC converter station? [8]
5. a) Briefly discuss about Individual Phase Control firing scheme of a HVDC system? [8]
- b) Draw and explain about the block diagram of a basic power and auxiliary controller used in HVDC transmission system? [8]
6. a) Compare SVC and STATCOM in various aspects? [8]
- b) What are the reactive power requirements in steady state? Also write about conventional and alternate control strategies in HVDC systems? [8]
7. a) Write the several problems associated with the injection of harmonics into the DC line? [8]
- b) Define harmonics? What are the factors responsible for the generation of harmonics and name some methods to eliminate harmonics? And also list out the problems caused due to harmonic instability? [8]