



**SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR**  
**(AUTONOMOUS)**  
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**QUESTION BANK (DESCRIPTIVE)**

**Subject with Code:** HVDC AND FACTS (18EE0230)

**Course & Branch:** B. Tech– EEE

**Year & Sem:** IV-B. Tech & I-Sem

**Regulation:** R19

**UNIT-I**  
**INTRODUCTION**

1. a) Distinguish between the AC and DC transmission systems? L3 CO1  
b) Discuss the different factors that favor HVDC transmission systems over EHVAC transmission over long distances. L4 CO1
2. Explain clearly about Typical Layout of Converter Station and their functions with neat sketch. L2 CO1
3. Discuss in detail the advantages and disadvantages of HVDC transmission system over HVAC transmission system. L4 CO1
4. What are different applications of HVDC transmission system? Explain them in detail? L1 CO1
5. With neat sketches, explain the different kinds of DC links available. L5 CO1
6. Explain how to plan a HVDC transmission system. L2 CO1
7. a) Explain the analysis of 6 pulse converter without overlap. L2 CO1  
b) Explain the analysis of 6 pulse converter with overlap. L2 CO1
8. Derive the expression for average DC voltage of a six-pulse bridge converter considering gate control and the source reactance. L5 CO1
9. Explain the different converter configuration commonly employed for HVDC converter and bring out their merits and de-merits. L2 CO1
10. Explain the individual characteristics of a rectifier and an inverter with sketches L2 CO1

**UNIT-II**  
**CONVERTER AND HVDC SYSTEM CONTROL**

1. Explain the basic principle of DC link control in HVDC system. L2 CO2
2. With block diagram, explain the hierarchical control structure for a DC link. L4 CO2
3. Explain the individual characteristics of a rectifier and inverter with sketches. L2 CO2
4. Write short notes on the following L5 CO2
  - a) Constant Alpha control
  - b) Inverse Cosine control.
5. Write short notes on the following terms L5 CO2
  - (a) Individual phase control
  - (b) Constant extinction angle

**HARMONICS, FILTERS AND REACTIVE POWER CONTROL**

6. What are the problems due to presence of harmonics? Explain the generation of harmonics in HVDC system? L1 CO2
7. What filter configurations are used in HVDC Converter stations? Give an example of a filter's design. L1 CO2
8. Derive an equation for harmonic voltage and current for single tuned filter and discuss the influence of network admittance. L4 CO2
9. Give a detailed account of design aspects of following filters L4 CO2
  - (a) Single tuned filter
  - (b) Double tuned filter
10. Mention the reasons for generation of harmonics in HVDC transmission. L3 CO2

**UNIT-III**

**POWER FLOW ANALYSIS IN AC/DC SYSTEMS**

1. Explain the solution of AC-DC Power flow using sequential method. L2 CO3
2. Explain the power flow analysis using simultaneous and sequential approach. L2 CO3
3. Obtain the mathematical models of a DC link. L3 CO3
4. a) Explain per unit system for DC quantities. L2 CO3  
b) Explain load flow in DC quantities. L2 CO3
5. a) Derive the mathematical model of dc link controllers of a dc link. L4 CO3  
b) Write the mathematical model of a dc converter L5 CO3

**FACTS CONCEPTS**

6. a) what are the factors which limit the loading capabilities of transmission line explain? L1 CO3  
b) Discuss the dynamic stability and power flow considerations of transmission system? L3 CO3
7. what are the controllable parameters? explain about importance of controllable parameters? L1 CO3
8. Explain about relative importance of different types of controllers? L2 CO3
9. Explain about flow of power in an A.c system and explain the L2 CO3  
a) Power flow in parallel paths.  
b) Power flow in meshed system.
10. Explain the basic types of the FACTS controllers and their applications. L2 CO3

**UNIT-IV**

**STATIC SHUNT COMPENSATORS**

1. What is the necessity of shunt compensation form the point of L1 CO4  
a) Midpoint voltage regulation  
b) Prevention of voltage instability
2. What are the objectives of shunt compensation? Explain how shunt compensation can improve dynamic performance of power system? L1 CO4
3. Explain about improvement of transient stability using shunt compensation? L2 CO4
4. Give a detailed dynamic performance comparison of svc and statcom. L4 CO4
5. a) Mention the different methods of controllable var generation? L3 CO4  
b) Describe the principle of operation of FC-TCR SVC with appropriate control scheme? L4 CO4

**STATIC SERIES COMPENSATORS**

6. a) what is a series compensation in transmission system? L1 CO4  
b) With the help of the diagram, discuss the impact of series compensation on a power system? L4 CO4
7. Describe the capabilities of series compensation in improving transient stability power oscillation damping and voltage stability? L4 CO4
8. Write short notes on the following? L5 CO4  
a) GTO thyristor-controlled series capacitor?  
b) Thyristor switched series capacitor (TSSC)?
9. Explain about basic operating control schemes for GCSC, TSSC and TCSC? L2 CO4
10. a) What are the objectives of series compensation? L1 CO4  
b) Explain about SSSC with neat diagram. L2 CO4

**UNIT-V**

**COMBINED COMPENSATORS**

1. Explain about unified power flow controller? L2 CO5
2. Explain about basic operating principle of UPFC? L2 CO5
3. Explain brief description about conventional transmission control capabilities? L2 CO5
4. Explain about independent real and reactive power flow control? L2 CO5
5. Explain about comparison of the UPFC to series compensators and phase angle regulators? L2 CO5
6. Explain about basic control structure of UPFC? L2 CO5
7. Explain about basic control system for P and Q control in UPFC? L2 CO5
8. Explain about dynamic performance of UPFC? L2 CO5
9. a) Explain about control structure of UPFC. L2 CO5  
b) Explain how the UPFC can control real and reactive power flow in the transmission line. L2 CO5
10. Explain the basic hybrid scheme of UPFC with a fixed phase shifting transformer. L2 CO5