FACTS: FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS

(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) Distinguish between transient stability and steady state stability in power flow systems. [4]
   b) Mention the importance of self commutating converters? [3]
   c) Write the three important objectives of shunt compensation. [3]
   d) What is meant by switched transients in thyristor switched capacitor? [4]
   e) What are the characteristics differences between TSSC and TCSC? [4]
   f) Mention the practical applications of IPFC. [4]

PART–B *(3x16 = 48 Marks)*

2. a) Discuss the various categories of FACTS controllers in brief. [8]
   b) Describe the parameter trade-off of high power devices. [8]

3. a) Explain the three phase full-wave bridge converter with necessary waveforms. [8]
   b) Enumerate the relative merits and demerits of current source converters over voltage source converters. [8]

4. a) Explain the concept of end of line voltage support to prevent voltage stability in shunt compensation. [8]
   b) Describe any of the variable impedance type static VAR generators. [8]

5. a) Discuss the implementation of the VAR reserve control. [8]
   b) Enumerate the operating features of STATCOM. [8]

6. a) Explain the power oscillation and sub synchronous oscillation damping in series capacitive compensation. [8]
   b) Describe the configuration and characteristics of basic thyristor-switched series capacitor. [8]

7. a) Explain the implementation of the UPFC by back-to-back voltage sourced converters. [8]
   b) Discuss the variation of real and reactive powers in IPFC schemes. [8]

FACTS: FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS
(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) Mention the voltage and current ratings of high power devices. [4]
   b) What are the effects of harmonics in a three phase bridge converter. [4]
   c) What is meant by power oscillations damping? [3]
   d) Draw the V-I characteristics of thyristor switched capacitor and explain. [4]
   e) Write any three functional requirements of series compensation. [3]
   f) What is a stand-alone series and shunt compensation? [4]

PART–B *(3x16 = 48 Marks)*

2. a) Explain various loading capability limits in power flow systems. [8]
   b) Describe relative importance of different types of controllers. [8]

3. a) Enumerate single phase full-wave bridge converter operation. [8]
   b) Discuss three-phase current source converter operation in brief. [8]

4. a) Explain midpoint voltage regulation for line segmentation using shunt compensation. [8]
   b) Emphasize features of thyristor controlled reactor. [8]

5. a) Obtain transfer function of static VAR compensator and mention its compensation effect on stability. [8]
   b) Explain necessary modifications in static VAR generation characteristics due to regulation slope. [8]

6. a) Draw and explain the impedance versus delay angle characteristics of TCSC. [8]
   b) Discuss improvement of transient stability using series compensation on transmission systems. [8]

7. a) Describe dependence of real and reactive power flow control in UPFC. [8]
   b) Write a comparison between IPFC and UPFC. [8]

FACTS: FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS

(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) Write the importance of controllable parameters in AC power flow systems. [4]
   b) Mention the various types of current source converters. [4]
   c) What is meant by controllable VAR generation? [3]
   d) Why static compensator not used as perfect voltage regulator? [3]
   e) Write the objectives of series compensation. [4]
   f) List out the technical benefits of UPFC. [4]

PART–B *(3x16 = 48 Marks)*

2. a) Explain the dynamic stability considerations of an interconnected transmission system. [8]
   b) Discuss the losses and speed of switching of high power devices. [8]

3. a) Describe the voltage-sourced converter concept with necessary schematics. [8]
   b) Explain the square wave voltage harmonics for a single phase bridge converter. [8]

4. a) Discuss the improvement of voltage stability using shunt compensation. [8]
   b) Write a comparison between thyristor controlled reactor and thyristor switched reactor. [8]

5. a) Write a comparison between STATCOM and SVC in the following
   (i) V-I characteristics (ii) transient stability. [8]
   b) What is meant by power oscillation damping? Explain its functional control implementation. [8]

6. a) Explain the operation of basic GTO-controlled series capacitor. [8]
   b) Discuss the configuration and operation of TCSC. [8]

7. a) Describe the basic operating principles and concepts of UPFC. [8]
   b) Explain the control structure of IPFC. [8]

FACTS: FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS

(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)	What are the requirements of high speed power devices?	[4]
	b)	What is the principle of voltage source converter?	[4]
	c)	List out the requirements of shunt compensation.	[3]
	d)	Mention the various control approaches in static VAR generation.	[4]
	e)	Write the basic principle difference between series and shunt compensation.	[4]
	f)	Explain the any three applications of UPFC.	[3]

PART–B *(3x16 = 48 Marks)*

2.	a)	Discuss the technical benefits of FACTS technology.	[8]
	b)	Explain the power flow considerations of a transmission interconnected systems.	[8]
3.	a)	Describe the operation of three-phase full-wave bridge converter.	[8]
	b)	Distinguish between voltage source and current source converters.	[8]
4.	a)	Describe the basic thyristor switched capacitor and its operation.	[8]
	b)	Explain the power oscillation damping in shunt compensation.	[8]
5.	a)	Discuss the operation of STATCOM with a neat diagram and characteristics.	[8]
	b)	Write a short note on transient stability enhancement using STATCOM and SVC.	[8]
6.	a)	Enumerate the basic operating control schemes of TSSC and TCSC.	[8]
	b)	Discuss the effect of series capacitive compensation in transmission lines.	[8]
7.	a)	Describe the various transmission control capabilities of UPFC.	[8]
	b)	Explain the basic two-converter Interline Power Flow Controller scheme.	[8]