Code No: **R42027** **R10** **Set No. 1**

IV B.Tech II Semester Regular Examinations, April/May - 2014

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS

(Electrical and Electronics Engineering)

Time : 3 hours **Max. Marks: 75**

Answer any Five Questions
All Questions carry equal marks
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1 Consider a mesh network in which generators at two different sites (A and B) are sending power to a load center (C) through a network consisting of three lines. The lines AB, BC and AC have continuous ratings of 1000 MW, 1250 MW and 2000 MW respectively. One of the generators (at A) is generating 2000 MW and the other is generating 1000 MW, a total of 3000 MW is delivered to load center. If the impedances of the line AB, BC and AC are 10 , 5, and 10 respectively,
   a) Find the power flowing through each of the line.
   b) If a capacitor whose reactance is -5 at the synchronous frequency is inserted in line AC, find the power flowing through each of the line.
   c) If an inductor whose reactance is 7 is inserted in series with line AB, find the power flowing through each of the line. [15]

2 What are FACTS controllers? What are their benefits? Explain different types of FACTS controllers with examples. [15]

3 a) With a neat circuit diagram, explain the basic operation of a voltage sourced converter. [7]
   b) What are the effects of harmonics? Prove that the fundamental RMS component of a square wave ac voltage for a single-phase bridge converter is 0.9 times the dc voltage. [8]

4 a) Explain the objective of reactive shunt compensation in transmission lines. [6]
   b) With phasor diagrams and power-angle characteristics, explain a two machine power system with ideal midpoint reactive compensation. [9]

5 a) List different methods for controllable var generation. [7]
   b) Explain the operation of Thyristor-Controlled Reactor (TCR) with necessary waveforms. [8]

6 a) What is SVC? What are its applications? [7]
   b) Draw and discuss the V-I characteristics of SVC. [8]

7 With relevant phasor diagrams and characteristics, discuss the concept of series capacitive compensation. [15]

8 What is UPFC? Explain its principle of operation. Discuss eh control schemes for UPFC. [15]

Code No: **R42027** **R10** **Set No. 2**

IV B.Tech II Semester Regular Examinations, April/May - 2014

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS

(Electrical and Electronics Engineering)

Time : 3 hours **Max. Marks: 75**

Answer any Five Questions

All Questions carry equal marks

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1	a)	What is the need for transmission interconnections? Explain.	[8]
	b)	Discuss how power flow can be controlled in parallel paths.	[7]
2	a)	List different opportunities for FACTS.	[7]
	b)	List and explain different high power devices used in FACTS devices with their voltage and current ratings.	[8]
3	a)	What are harmonics? Explain the need for the mitigation of harmonics.	[6]
	b)	With a neat circuit and waveforms, explain the operation of a single-phase full-wave bridge converter.	[9]
4	a)	What are the objectives of shunt compensation?	[5]
	b)	Discuss the improvement of transient stability with midpoint voltage regulation of a line.	[10]
5		With circuit diagram and waveforms, explain the operation of TCR and TSR. Draw their V-I characteristics. Also differentiate between them.	[15]
6	a)	What is regulation droop? Explain its significance.	[7]
	b)	What is STATCOM? Explain its operation.	[8]
7		Explain the voltage stability enhancement and power oscillation damping with series capacitive compensation.	[15]
8		What is Interline Power Flow Controller? How is it different from Unified Power Flow controller? Discuss its applications.	[15]

Code No: **R42027** **R10** **Set No. 3**

IV B.Tech II Semester Regular Examinations, April/May - 2014

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS

(Electrical and Electronics Engineering)

Time : 3 hours **Max. Marks: 75**

Answer any Five Questions

All Questions carry equal marks

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1	a)	What are the limitations for the loading capability of a transmission line? Explain.	[8]
	b)	How can the power flow controlled in mesh networks.	[7]
2	a)	What are FACTS? Give the basic types of FACTS controllers.	[7]
	b)	Explain the characteristics of high power devices used in FACTS.	[8]
3	a)	Compare between voltage sourced converters and current sourced converters.	[6]
	b)	Explain the operation of a three-phase full wave bridge converter. Draw the necessary waveforms.	[9]
4	a)	"For a radial line, the end of the line is the best location for compensator". Justify.	[6]
	b)	Explain how midpoint voltage regulation helps in increasing the transmittable power of a line.	[9]
5	a)	Explain the operation of Thyristor-Switched Capacitor (TSC).	[7]
	b)	With circuit diagram and waveforms, explain the operation of Thyristor-Switched Reactor (TSR).	[8]
6		Discuss the operation of STATCOM. Draw their V-I operating characteristics. Discuss the transient stability enhancement with STATCOM.	[15]
7		With the help of circuit diagram and waveforms, discuss the application of TSSC for series compensation. Also represent their V-I characteristics.	[15]
8	a)	What is IPFC? Explain the operating principle of it.	[7]
	b)	Compare between combined shunt-series compensators and individual compensators.	[8]

Code No: **R42027** **R10** **Set No. 4**

IV B.Tech II Semester Regular Examinations, April/May - 2014

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS

(Electrical and Electronics Engineering)

Time : 3 hours **Max. Marks: 75**

Answer any Five Questions

All Questions carry equal marks

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1 a) "Injecting the voltage into transmission line perpendicular to the line current mostly changes the active power". Justify with the help of phasor diagram. [8]

b) What are the parameters of the transmission line that can be controlled to control the power flow? Ex-plain the importance of these parameters. [7]

2 a) What are the major issues in AC power transmission? Explain how they addressed using FACTS devices. [8]

b) Classify different FACTS controllers. Explain them briefly. [7]

3 a) What are current sourced converters? Explain their operation. [6]

b) Derive the expressions for the fundamental and harmonic components of the ac voltage of a three-phase bridge converter. [9]

4 What are the objectives of static shunt compensation? Discuss the improvement of transient stability with midpoint voltage regulation. [15]

5 Explain the operation of a Fixed Capacitor, Thyristor Controlled Reactor (FC-TCR) type var generator. Also represent their V-I operating area. [15]

6 a) Explain the operating V-I characteristics of SVC and STATCOM. [7]

b) With a neat block diagram, explain the implementation of power oscillation damping by using static var generators. [8]

7 What is the use of Thyristor-Controlled Series Capacitor (TCSC)? With a neat circuit diagram and waveforms explain its operation. [15]

8 a) Explain the advantages of combined shunt-series compensators over individual compensators. [7]

b) Explain the operation of UPFC. [8]