KANDULA SRINIVASA REDDY MEMORIAL COLLEGE OF ENGINEERING (AUTONOMOUS)

KADAPA-516005. AP

(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)

(An ISO 9001-2008 Certified Institution)

DEPARTMENT OF EEE



VALUE ADDED COURSE

ON

"AI CONTROL TECHNIQUES FOR FACTS DEVICES"

Coordinator: Mr. N. Siddhik, Assistant Professor, EEE, KSRMCE

Resource Person: Mr. M. Bhaskar Reddy, Associate Professor, EEE, KSRMCE

Duration: 01/02/2023 to 17/02/2023



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Lr./KSRMCE/EEE/2022-23/

Date: 28-01-2023

To The Principal, KSRMCE, Kadapa.

Respected Sir.

Sub: Permission to Conduct Value Added Course on "AI Control Techniques for FACTS Devices" from 01-02-23 to 17-02-23 - Req. - Reg.

The Department of EEE is planning to Conduct Value Added Course on "AI Control Techniques for FACTS Devices" for B. Tech final year students from 01-02-23 to 17-02-23. In this regard, I kindly request you to grant permission to conduct Certification Course.

Thanking you sir,

forwarded to Principal Sir, O-51/hy Oh. 28.1.23

Yours faithfully

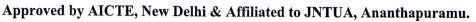
(Mr. N. Siddhik)

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Cr./KSRMCE/EEE/2022-23/

Date: 30/01/2023

Circular

The Department of EEE is offering a Value Added Course on "AI Control Techniques for FACTS Devices" from 01/02/2023 to 17/02/2023 to B. Tech final year students. In this regard, interested students are requested to register for the Value Added Course.

For further information contact Course Coordinators.

Course Coordinators: Mr. N. Siddhik, Assistant Professor, Dept. of EEE - KSRMCE.

Contact No: 9642073661

(O) - S. My Can HOD 30-1-23

Dept. of EEE

HEAD

Department of Electrical & Electronics Engineering K.S.R.M. College of Engineering

Kadapa -516003.

Cc to:

IQAC-KSRMCE



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Date: 01-02-23

DEPARTMENT OF EEE

REGISTRATION FORM

Value Added Course

On

"AI Control Techniques for FCATS Devices" From 01/02/2023 to 17/02/2023

S. No	Full Name	Roll Number	Branch	Semester	Signature
1	ADIMULAM GANGADHAR	209Y1A0201	EEE	VII	A.Gangadha
2	AMBAVARAM SANJANA (W)	209Y1A0202	EEE	VII	A. Sanjana
3	BANDI NEERAJA REDDY (W)	209Y1A0203	EEE	VII	B. NeevaJa reddy.
4	BERI YASWANTH	209Y1A0204	EEE	VII	B. Yoshanth
5	CHEMIKALA RAMA DEVI (W)	209Y1A0205	EEE	VII	C. Rana Pai
6	DUGGIREDDY DHARANI (W)	209Y1A0207	EEE	VII	Dharani
7	DUGGIREDDY TEJASWINI (W)	209Y1A0209	EEE	VII	Teiaswini
8	GADWALA LINGAMAIAH	209Y1A0211	EEE	VII	Gilinga maian.
9	GANDLA VENKATA SUNIL KUMAR	209Y1A0212	EEE	VII	D. Sungl kumar
10	KANJEEVARAM SAI RAHUL	209Y1A0214	EEE	VII	K. sairahal
11	KARNATAKAM LIKHITHA (W)	209Y1A0216	EEE	VII	K. Whilesh
12	KATIKA MOHAMMED KAIF ALI	209Y1A0217	EEE	VII	by Mohammed
13	KORAMUTLA MOHAN KRISHNA	209Y1A0218	EEE	VII	K. Mohan Kvishna
14	KUMMARA VENKATA	209Y1A0219	EEE	VII	K. Venkorto

S. No	Full Name	Roll Number	Branch	Semester	Signature
	SAI				K. Hemanty
15	KUMMARI HEMANTH KUMAR	209Y1A0220	EEE	VII	1)
16	MADIREDDY GOWRI (W)	209Y1A0222	EEE	VII	M. Gowri
17	MALLELA CHANDRA BHARATH KUMAR REDDY	209Y1A0223	EEE	VII	BHARATH KUMAS REDDM
18	MALLEM CHARAN KUMAR	209Y1A0225	EEE	VII	Mallem CHard Kumaur
19	MUDDA MAHA LAKSHMI (W)	209Y1A0226	EEE	VII	Lakshmi Lakshmi
20	MUPPALLA PAVAN KUMAR	209Y1A0227	EEE	VII	Mitarau
21	NAREDDY SASI REKHA (W)	209Y1A0228	EEE	VII	N. Sos, Rember
22	NARUBOINA NAVEEN KUMAR	209Y1A0229	EEE	VII	N. Nonean Kuma
23	PACHIPALA YOGNA (W)	209Y1A0230	EEE	VII	P. Xbig Nov
24	PANCHAMARTHI DAYANANDA	209Y1A0231	EEE	VII	- ayanta
25	PENUGONDA RAVI SHANKAR	209Y1A0232	EEE	VII	- Eaukhar
26	POTHURAJU SAI VIGNESH	209Y1A0233	EEE	VII	P. See vignos
27	SHAIK ALISHA SAMEERA (W)	209Y1A0240	EEE	VII	S. Alasher
28	SHAIK MAHAMMAD JAVEED	209Y1A0242	EEE	VII	S.M. Jewes
29	SHAIK MOHAMMED SAMEER	209Y1A0243	EEE	VII	Shair Mohana Sau
30	SHAIK PARVEZ	209Y1A0244	EEE	VII	S. Dornez
31	TALUPULA PALLAVI (W)	209Y1A0248	EEE	VII	T. Pallan
32	VEERAMALLU VINAY	209Y1A0249	EEE	VII	V/NOW
33	YANGAMMAGARI SOMASHEKAR REDDY	209Y1A0252	EEE	VII	Charlon
34	BUSAGANI CHANDRA KUMAR	219Y5A0202	EEE	VII	B. Classica burnas
35	MAYAKUNTLA SRINIDHI (W)	219Y5A0203	EEE	VII	M. Scinidh

Coordinators:

/ksrmce.ac.in

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/ksrmceofficial Enginee K.S.R.M. College of Enginee Kadapa -516003.

SYLLABUS

AI CONTROL TECHNIQUES FOR FACTS DEVICES

Course Description: This course introduces AI control techniques for FACTS devices. Students will be equipped with fundamentals of FACTS controllers and the possibility of implementing AI Control Techniques..

Course Objectives:

- 1. Introduce the student to the fundamentals of AI Techniques
- 2. Acquire knowledge to implement AI Techniques in FACTS devices

Course Outcomes:

- 1. To understand the fundamentals of AI Techniques
- 2. Demonstrate various neural networks and genetic algorithms
- 3. Review basic concepts related to FACTS devices
- 4. Formulate the problems for solving the various FCATS devices using AI techniques.
- 5. Testing of various FACTS devices using AI techniques.

Course Content:

Module I:

Conventional reactive power compensation, Theory of Power Transmission Control, Basic principle of FACTS (Flexible AC Transmission System), Principle of Static VAr compensation (SVC). Basic Principle of Thyristor Controlled Series Compensation (TCSC) Basic series and shunt FACTS devices. Advance new generation FACTS devices, Control and coordination of FACTS devices, Locations of FACTS Devices.

Module II:

Concept of artificial intelligence, Problem solving methods and searching techniques. Fuzzy sets, Operation on fuzzy sets, Fuzzy relations, Fuzzy measures, Fuzzy logic, Fuzzy controller.

Module III:

Fundamental concepts, Basic models, Learning rules, Single layer and multi-layer feed-forward and feedback networks, Supervised and unsupervised learning, Recurrent networks, Modular network, Self organizing maps, Function networks, Neural network controller, Basic principle, Evolution of genetic algorithm, Hybrid genetic algorithm. Hybrid Systems: Integrated neural-

fuzzy system simulated evolution for neural network learning, Fast learning algorithms for training NN

Module IV:

Design problems on EHVAC long lines, Sub-synchronous resonance problem and counter measures, High voltage testing of AC equipment, Comparison of EHV AC & DC transmission HVDC system configuration and components conversion and inversion

Module V:

Analysis of three phase bridge converter and Performance equations, Control of HVDC system, Principle of DC link control, current and Extinction angle control, Transmission power control, alternative inverter control modes, Harmonics and AC/DC filters, Interaction responses to DC and AC system faults. Modelling of HVDC system.

Text Books:

- 1. Understanding FACTS, N.G.Hingorani and L. Gyugyi, IEEE Press 2001
- 2. FACTS: Modelling and Control, X.P. Zhang, Cristian Rehlanz, Bikash Pal, Springer Publications. 3. FACTS, Y.H. Song, A Johns, IET Publications.
- 3. ROBUST DESIGN OF FACTS CONTROLLER USING AI TECHNIQUE by Mohapatra, Biswajit / Sahoo, Amit Kumar

Reference Books:

- 1. Lin, C., Lee, G., Neural Fuzzy Systems, Prentice Hall International Inc. (2000).
- 2. Rajashekran, S. and VijaylaksmiPai, G.A., Neural Networks, Fuzzy Logic and GeneticAlgorithm Systhesis and Applications, Prentice-Hall of India Private Limited (2004).
- 3. Taylor, C.W., Power System Stability, McGraw-Hill (2007).
- 4. Kosko, B., Neural Networks and Fuzzy Systems: a Dynamical systems Approach to Machine Intelligence, Prentice-Hall of India Private Limited (1992).
- 5. Zurda, J.M., C++ Neural Networks and Fuzzy Logics, BPS Publication (2001).



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SCHEDULE

Department of EEE

Value Added Course

On

"AI Control Techniques for FACTS Devices" From 01/02/2023 to 17/02/2023

Date	Timing	Resource Person	Topic to be covered
01/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	Conventional reactive power compensation, Theory of Power Transmission Control, Basic principle
			of FACTS (Flexible AC Transmission System),
02/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	Principle of Static VAr compensation (SVC). Basic Principle of Thyristor Controlled Series Compensation (TCSC) Basic series and shunt FACTS devices
03/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	Advance new generation FACTS devices.
04/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	Control and coordination of FACTS devices, Locations of FACTS Devices.
06/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	Concept of artificial intelligence, Problem solving methods and searching techniques
07/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	Fuzzy sets, Operation on fuzzy sets, Fuzzy relations, Fuzzy measures, Fuzzy logic, Fuzzy controller.
08/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	Fundamental concepts, Basic models, Learning rules, Single layer and
09/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	multi-layer feed-forward and feedback networks, Supervised and unsupervised learning
10/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	Recurrent networks, Modular network, Self organizing maps
13/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	, Function networks, Neural network controller
14/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	Basic principle, Evolution of genetic

			algorithm, Hybrid genetic algorithm. Hybrid Systems: Integrated neural- fuzzy system simulated evolution for neural network learning, Fast learning
15/02/23	3 PM to 6 PM	Mr. M. Bhaskara Reddy	algorithms for training NN Design problems on EHVAC long lines, Sub-synchronous resonance problem and counter measures, High voltage testing of AC equipment,
16/02/23	4 PM to 6 PM	Mr. M. Bhaskara Reddy	Comparison of EHV AC & DC transmission HVDC system configuration and components conversion and inversion, Analysis of three phase bridge converter and Performance equations, Control of HVDC system
17/02/23	4 PM to 6 PM	Mr. M. Bhaskara Reddy	, Principle of DC link control, current and Extinction angle control, Transmission power control, alternative inverter control modes, Harmonics and AC/DC filters, Interaction responses to DC and AC system faults. Modelling of HVDC system.

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Department of Electrica: 4 Electronics Engineer 3 K.S.R.M. College of Engineering Kadapa -516003.



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DEPARTMENT OF EEE

Attendance sheet of Value Added Course on "AI Control Techniques for FACTS Devices" From 01/02/2023 to 17/02/2023

Sl. No.	Roll No.	Name	01/02/2023	02/02/2023	03/02/2023	04/02/2023	06/02/2023	07/02/2023	08/02/2023	09/02/2023	10/02/2023	13/02/2023	14/02/2023	15/02/2023	16/02/2023	17/02/2023
1	209Y1A0201	Adimulam Gangadhar	ganga	ganda	cen ga	ganga	gener	garga	gente	gurge	Duran	gura	grage	arga	Qurge	garga
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11	209Y1A0216	Karnatakam Likhitha (W)				_				Unitha.	· Kashiri acception					
12	209Y1A0217	Katika Mohammed Kaif Ali	Ali	Ali	Ali	Al:	Ali	Al:	Al:				1		4 1	. 11
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17	209Y1A0223	Mallela Chandra Bharath Kumar Reddy		1 1						chardia						
18	209Y1A0225	Mallem Charan Kumar								Charan						
19	209Y1A0226	Mudda Maha Lakshmi (W)	Male	Melo	make	Males	Marilia	Made	Mal.	maka	cracan	o uces	Chabi	Crace	Chalan	Chapt
20	209Y1A0227	Muppalla Pavan Kumar	Pavan	Onen	DILE	Polon	Dana	D. min	Colta	Pavar	Maka	Qu.	MOUS	Mothe	Make	Maha
21	209Y1A0228	Nareddy Sasi Rekha (W)		S. S.	Caro	Sasi	Cai	Sali	Con	Sasi.	Soi	Co	Kalan	Gan	FOLGIN	Rivan
22	209Y1A0229	Naruboina Naveen Kumar	Marken	ADIE	AMILE	Nhi ku	Alaksan	cl vi	1000	Marbon	16.00	2000 abildas	Austr	Soist	Sast	1802
23	209Y1A0230	Pachipala Yogna (W)	Young	Young	Young	Yana	Vana	Your	VANDO.	Yogna	Moveon	Moreel	1vqven	Naveen	Lovean	Nalpoy
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Coordinator(s)

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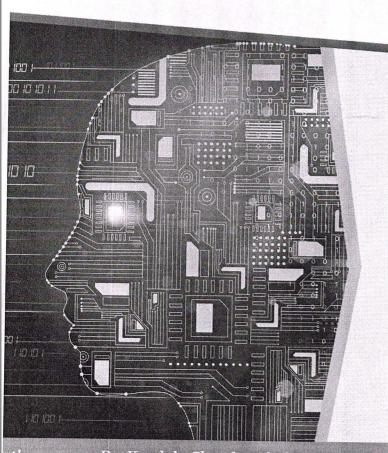
Department of Electrical & Electronics Engineering

K.S.R.M. College of Engineering Kadapa -516003.

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New Delhi & Affiliated to JNTUA, Ananthapuramu.

CONTROL TECHNIQUES FOR FACTS DEVIC





Department of EEE, KSRMCE



SJ 112



01-02-23

to

17-02-23

Resource Person Mr. M. Bhaskara Reddy

Associate Professor, EEE

Coordinator Mr. N. Siddhik

Dr. Kandula Chandra Obul Reddy (MD, KGI)

Smt. K.Rajeswari (Correspondent, Secretary, Treasurer)

Sri K. Madan Mohan Reddy (Vice - Chairman)

Sri K. Raja Mo (Chairm

eofficial



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Department of EEE

Activity Report

Name of the Activity

: Value Added Course

Title of the Course

: Al Control Techniques for FACTS Devices

Date (s) covered

: 01-02-2023 to 17-02-2023

No of Hours

: 40

Target Audience

B. Tech VII semester students

No. of Participants

Resource Persons

: Mr. M. Bhaskara Reddy

Associate Professor, EEE, KSRMCE

Venue of the Event

: SJ-112

Certificate Course Description:

Department of EEE, KSRMCE has organized a Value Added Course on "AI Control Techniques for FACTS Devices" from 01-02-2023 to 17-02-2023. This course covers 40 hours duration. Totally 35 students has registered for this course. The resource persons are explained about various AI control techniques for FCATS devices. Design of FACTS using AI techniques has been implemented in MATLAB Simulink by the students. The prescribed syllabus of this value added course is enclosed here with this report.

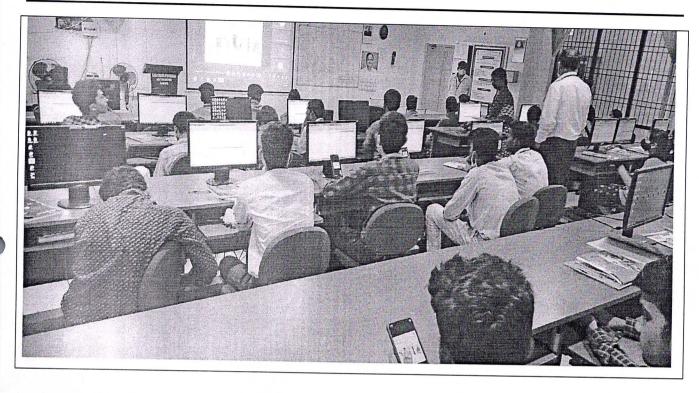
The pictures taken during the course are given below:



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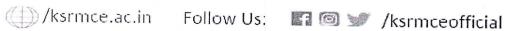




Head of the Department

HEAD

Department of Electrical & Electronics Engineering K.S.R.M. College of Engineering Kadapa -516003.









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Certificate

This is to certify that Adimulam Gangadhar bearing roll no: 209Y1A0201 has attended a Value Added Course on Al Control Techniques for FACTS Devices organized by the Department of EEE, KSRM College of Engineering (Autonomous) from 01-02-23 to 17-02-23

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Co-ordinators

(D.S. My Carlow.

HoD, EEE

V. S. Smut



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Certificate

This is to certify that Chemikala Rama Devi bearing roll no: 209Y1A0205 has attended a Value Added Course on Al Control Techniques for FACTS Devices organized by the Department of EEE, KSRM College of Engineering (Autonomous) from 01-02-23 to 17-02-23

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Co-ordinators

(D.S. My Darham.

HoD, EEE

V. S. Smut



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Certificate

This is to certify that **Kanjeevaram Sai Rahul** bearing roll no: **209Y1A0214** has attended a Value Added Course on **Al Control Techniques for FACTS Devices** organized by the Department of EEE, KSRM College of Engineering (Autonomous) from 01-02-23 to 17-02-23

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Co-ordinators

M.S. My Darhur.

HoD, EEE

V. S. Smut

Feedback form on Value Added Course " Al Control Techniques for FACTS Devices" from 01-02-23 to 17-02-23

* !n	dicates required question
1.	Roll Number *
2.	Name of the Student *
3.	The objectives of the Value Added Course were met (Objective) * Mark only one oval.
	Excellent Good
	Satisfactory Poor
4.	The content of the course was organized and easy to follow (Delivery) *
	Mark only one oval.
	Excellent
	Good Satisfactory
	Poor

	.	(Interaction)	
		Mark only one oval.	
		Excellent Good Satisfactory Poor	
	6.	The exercises/role play were helpful and relevant (Syllabus Coverage) *	
		Mark only one oval.	
		Excellent Good Satisfactory Poor	
	7.	The Value Added Course satisfy my expectation as a value added Programme * (Course Satisfaction) Mark only one oval.	
-		Excellent Satisfactory Good Poor	
	8.	Any Issues	

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Value Added Course on "AI Control Techniques for FACTS Devices" 01/02/2023 to 17/02/2023

Feedback responses

C No.	Roll number	Name of the Student	The objectives of the Value Added Course were met (Objective)	The content of the course was organized and easy to follow (Delivery)	The Resource Persons were well prepared and able to answer any question (Interaction)	The exercises/role play were helpful and relevant (Syllabus Coverage)	The Value Added Course satisfy my expectation as a value added Programme (Course Satisfaction)	Any Issues
S.No.	209Y1A0201	Adimulam Gangadhar	Excellent	Excellent	Excellent	Excellent	Excellent	Nothing
2	209Y1A0202	Ambavaram Sanjana (W)	Excellent	Excellent	Excellent	Excellent	Excellent	very good
3	209Y1A0203	Bandi Neeraja Reddy (W)	Good	Good	Good	Good	Good	very good
4	209Y1A0204	Beri Yaswanth	Excellent	Excellent	Excellent	Excellent	Excellent	very good
5	209Y1A0205	Chemikala Rama Devi (W)	Excellent	Excellent	Excellent	Excellent	Excellent	nothing
6	209Y1A0207	Duggireddy Dharani (W)	Excellent	Excellent	Excellent	Excellent	Excellent	Good
7	209Y1A0209	Duggireddy Tejaswini (W)	Excellent	Excellent	Excellent	Excellent	Excellent	Good
8	209Y1A0211	Gadwala Lingamaiah	Excellent	Excellent	Excellent	Excellent	Excellent	nothing

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9	209Y1A0212	Gandla Venkata Sunil Kumar	Excellent	Excellent	Excellent	Excellent	Excellent	nothing
10	209Y1A0214	Kanjeevaram Sai Rahul	Good	Good	Good	Good	Good	nothing
11	209Y1A0216	Karnatakam Likhitha (W)	Excellent	Excellent	Excellent	Excellent	Excellent	Good
12	209Y1A0217	Katika Mohammed Kaif Ali	Excellent	Excellent	Excellent	Excellent	Excellent	Good
13	209Y1A0218	Koramutla Mohan Krishna	Good	Good	Good	Good	Good	very good
14	209Y1A0219	Kummara Venkata Sai	Excellent	Excellent	Excellent	Excellent	Excellent	very good
15	209Y1A0220	Kummari Hemanth Kumar	Excellent	Excellent	Excellent	Excellent	Excellent	nothing
16	209Y1A0222	Madireddy Gowri (W)	Good	Good	Good	Good	Good	very good
17	209Y1A0223	Mallela Chandra Bharath Kumar Reddy	Excellent	Excellent	Excellent	Excellent	Excellent	no
18	209Y1A0225	Mallem Charan Kumar	Good	Good	Good	Good	Good	nithing
19	209Y1A0226	Mudda Maha Lakshmi (W)	Excellent	Excellent	Excellent	Excellent	Excellent	Good
20	209Y1A0227	Muppalla Pavan Kumar	Excellent	Excellent	Excellent	Excellent	Excellent	Good
21	209Y1A0228	Nareddy Sasi Rekha (W)	Excellent	Excellent	Excellent	Excellent	Excellent	Good
22	209Y1A0229	Naruboina Naveen Kumar	Excellent	Excellent	Excellent	Excellent	Excellent	Good
23	209Y1A0230	Pachipala Yogna (W)	Excellent	Excellent	Excellent	Excellent	Excellent	Good
24	209Y1A0231	Panchamarthi Dayananda	Good	Good	Good	Good	Good	Good
25	209Y1A0232	Penugonda Ravi Shankar	Excellent	Excellent	Excellent	Excellent	Excellent	Good
26	209Y1A0233	Pothuraju Sai Vignesh	Excellent	Excellent	Excellent	Excellent	Excellent	Nothing
27	209Y1A0240	Shaik Alisha Sameera (W)	Excellent	Excellent	Excellent	Excellent	Excellent	no
28	209Y1A0242	Shaik Mahammad Javeed	Excellent	Excellent	Excellent	Excellent	Excellent	no
29	209Y1A0243	Shaik Mohammed	Excellent	Excellent	Excellent	Excellent	Excellent	no

		Sameer						
30	209Y1A0244	Shaik Parvez	Excellent	Excellent	Excellent	Excellent	Excellent	no
31	209Y1A0248	Talupula Pallavi (W)	Excellent	Excellent	Excellent	Excellent	Excellent	nothing
32	209Y1A0249	Veeramallu Vinay	Good	Good	Good	Good	Good	Nothing
33	209Y1A0252	Yangammagari Somashekar Reddy	Excellent	Excellent	Excellent	Excellent	Excellent	no
34	219Y5A0202	Busagani Chandra Kumar	Excellent	Excellent	Excellent	Excellent	Excellent	Nothing
35	219Y5A0203	Mayakuntla Srinidhi (W)	Excellent	Excellent	Excellent	Excellent	Excellent	Good

Coordinator

HoD/EEE

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AI CONTROL TECHNIQUES FOR FACTS DEVICES FROM 01/02/2023 TO 17/02/2023 AWARD LIST

S.No	Roll Number	Name of the Student	Marks Obtained
1	209Y1A0201	Adimulam Gangadhar	12
2	209Y1A0202	Ambavaram Sanjana (W)	16
3	209Y1A0203	Bandi Neeraja Reddy (W)	17
4	209Y1A0204	Beri Yaswanth	19
5	209Y1A0205	Chemikala Rama Devi (W)	15
6	209Y1A0207 Duggireddy Dharani (W)		18
7	209Y1A0209	Duggireddy Tejaswini (W)	16
8	209Y1A0211	Gadwala Lingamaiah	14
9	209Y1A0212	Gandla Venkata Sunil Kumar	14
10	209Y1A0214	Kanjeevaram Sai Rahul	17
11	209Y1A0216	Karnatakam Likhitha (W)	16
12	209Y1A0217	Katika Mohammed Kaif Ali	16
13	209Y1A0218	Koramutla Mohan Krishna	19
14	209Y1A0219	Kummara Venkata Sai	20
15	209Y1A0220	Kummari Hemanth Kumar	15
16	209Y1A0222	Madireddy Gowri (W)	16
17	209Y1A0223	Mallela Chandra Bharath Kumar Reddy	16
18	209Y1A0225	Mallem Charan Kumar	18
19	209Y1A0226	Mudda Maha Lakshmi (W)	18
20	209Y1A0227	Muppalla Pavan Kumar	19
21	209Y1A0228	Nareddy Sasi Rekha (W)	17
22	209Y1A0229	Naruboina Naveen Kumar	15
23	209Y1A0230	Pachipala Yogna (W)	16
24	209Y1A0231	Panchamarthi Dayananda	15
25	209Y1A0232	Penugonda Ravi Shankar	17
26	209Y1A0233	Pothuraju Sai Vignesh	16
27	209Y1A0240	Shaik Alisha Sameera (W)	16
28	209Y1A0242	Shaik Mahammad Javeed	15
29	209Y1A0243	Shaik Mohammed Sameer	17
30	209Y1A0244	Shaik Parvez	15
31	31 209Y1A0248 Talupula Pallavi (W)		19
32	209Y1A0249	Veeramallu Vinay	16
33	209Y1A0252	Yangammagari Somashekar Reddy	19
34	219Y5A0202	Busagani Chandra Kumar	14
35	219Y5A0203	Mayakuntla Srinidhi (W)	16

Coordinator(s)

Head Head Department of Electrical & Electronics Engineering K.S.R.M. College of Engineering Kadapa -516003.

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D. Power factor

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AI CONTROL TECHNIQUES FOR FACTS DEVICES FROM 01/02/2023TO 17/02/2023 **ASSESSMENT TEST** Date: 17/2/2023 Roll Number: 209 11 A0201 Name of the Student: Time: 20 Min (Objective Ouestions) Max.Marks:20 Note: Answer the following Questions and each question carries one mark. 1. FACTS devices used in A. Generation B. AC Transmission C. DC Transmission D. None 2. Voltage Control means Boosting the feeder voltage B. Reducing the Line Voltage C. Voltage level within the allowable limits D. None 3. Line drop compensation corrects for Line drop lagging P.F B. Voltage at leading P.F C. Transformer voltage drop D. voltage drop in feeder lines 4. Which are the shunt compensation? A. TCSC B. SSSC C. UPFC D. SVC 5. FACTS devices are generally used for to compensate of the transmission A. reactive power B. active power c. apparent power d. None 6. Transmission efficiency increases as A. voltage and power factor both increase B. B. voltage and power factor both decrease C. voltage increases but power factor decreases D. D. voltage decreases but power factor increases. 7. SVC and STATCOM are A. series B. series and shunt C. shunt and series 8. SVC stands for A. Static Var Compensator B. Static voltage controller B. Static var converter D. Static voltage converter

regulating device.

C. Current and Voltage

9. STATCOM is

A. Current B. Voltage

10. The main Objective of series compensation	$[\alpha]$
A. It improve the power factor B. It reduces the fault currents	<i>v</i>
B. Reduce the voltage drop over long distance D. None	
11. TCSC is a	[M]/
A. Shunt compensation device B. Series compensation device	
B. C. Both A & B D. None of the above	
	4
12. Disadvantage with series compensation	[a]
A. Reduce the stability B. increase the voltage drop	
C. Reduce the power factor D. Increase in fault current	
10 The state of th	
13. Transmission Interconnection is done for A. economic reasons B. to reduce the cost of electricity and	1 91
C. to improve reliability of power supply. D. All of these	
C. to improve remainity of power suppry.	
14. FACTS controllers can enable a line to carry power closer to its	rbl/
A. Full efficiency B. Dielectric rating c. Thermal rating D. Both	A and B
	۸
15. What limits the loading capability	[b]/<
A. Thermal B. Dielectric	, (
C. Stability D. All of these	,
16. Basic types of FACTS controller	[L].
A. Series Controllers and Shunt Controllers B. Combined series-series Control	llers
C. Combined series-shunt Controllers D. All of these	
C. Comomou ourse summer some constant	
17. The voltage fluctuations are largely a consequence of the in series imp	pedances of lines,
transformers, and generators.	
A. Current B. Power C. Voltage drop D. None of these	
10 Objectives of Lord commencation	$r = 1 \times 0$
18. Objectives of Load compensation A. Power-factor correction. B. Improvement of voltage regulation.	101
C. Load balancing D. All of these	
19. What is the necessity of compensation?	
A. Voltage profile B. Power angle characteristics	2 0(3
C. Stability margin D. Damping to power oscillations	
	/
20. FACTS mainly find application in following areas.	I at
A. Power transmission B. Power Quality C. Railway Grid Connection	on
D. Wind power grid Connection	

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AI CONTROL TECHNIQUES FOR FACTS DEVICES FROM 01/02/2023TO 17/02/2023

R	coll Number: 20971A02		IENT TEST of the Student:	Sour San	:17/02/23
N	Time: 20 Min ote: Answer the following Que		jective Questions)	mark	Max.Marks:20
	FACTS devices used in A. Generation B. AC Trans				[6]
2.	Voltage Control means A. Boosting the feeder v C. Voltage level within the a	•	educing the Line Voltages D. None	ge	
3.	Line drop compensation corr. A. Line drop lagging P.I.		B. Voltage at leading	g P.F	1 b x
4.	C. Transformer voltage drop Which are the shunt compen A. TCSC B. SS	sation?	oltage drop in feeder lin	nes D. SVC	[]
5.	FACTS devices are generally A. reactive power B. act	y used for to c		of the transi	mission [
6.	Transmission efficiency income. A. voltage and power factor. B. B. voltage and power factor. C. voltage increases but poor. D. D. voltage decreases but	reases as both increase ctor both decre wer factor dec	e ease reases		[0]
7.	SVC and STATCOM areA. series B. ser	ies and shunt	devices. C. shunt and	l series	D. shunt
8.	A. Static Var Compensator B. Static var converter		ltage controller ltage converter		162
9.	. STATCOM is A. Current B. Voltage	regulating C. Current a		D. Power	factor

10. The main Objective of series compensation A. It improve the power factor B. It reduces the fault currents B. Reduce the voltage drop over long distance D. None	[b]
11. TCSC is a A. Shunt compensation device B. C. Both A & B B. Series compensation device D. None of the above	$[\alpha]$
12. Disadvantage with series compensation A. Reduce the stability B. increase the voltage drop C. Reduce the power factor D. Increase in fault current	[C *
13. Transmission Interconnection is done for	
14. FACTS controllers can enable a line to carry power closer to its A. Full efficiency B. Dielectric rating c. Thermal rating D. Bot	h A and B
15. What limits the loading capability A. Thermal B. Dielectric C. Stability D. All of these	
16. Basic types of FACTS controller A. Series Controllers and Shunt Controllers B. Combined series-series Controllers C. Combined series-shunt Controllers D. All of these	rollers d
17. The voltage fluctuations are largely a consequence of the in series in transformers, and generators. A. Current B. Power C. Voltage drop D. None of these	
18. Objectives of Load compensation A. Power-factor correction. B. Improvement of voltage regulation.	[4]0
C. Load balancing D. All of these 19. What is the necessity of compensation? A. Voltage profile B. Power angle characteristics C. Stability margin D. Damping to power oscillations	[Q]
 20. FACTS mainly find application in following areas. A. Power transmission B. Power Quality C. Railway Grid Connect D. Wind power grid Connection 	$[\mathcal{C}_{\mathcal{X}}]$



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AI CONTROL TECHNIQUES FOR FACTS DEVICES FROM 01/02/2023TO 17/02/2023

ASSESSMENT TEST
Date: 17/02/2023

Coll Number: 204 4/0 0 2 0 3 Name of the Student: R. Negarofo Pool day

R	oll Number: 2094140203	Name of the St	tudent: _ B .	Neevaga	Reddy
No	Time: 20 Min te: Answer the following Question	(Objective (Questions)		Max.Marks:20
INO	te. Answer the following Question	ons and each questi	on carries one	mark.	
1.	FACTS devices used in A. Generation B. AC Transmis	sion C. DC Transı	nission D. No	one	[a]
2.	Voltage Control means A. Boosting the feeder volta C. Voltage level within the allow			ţе	[]
3.	Line drop compensation correct A. Line drop lagging P.F		oltage at leadin	g P.F	[a /
4.	C. Transformer voltage drop Which are the shunt compensati A. TCSC B. SSSC	on?	op in feeder lin PFC	D. SVC	[b)<
5.	FACTS devices are generally us	ed for to compensa	ate	of the transm	ission
	A. reactive power B. active	power c. app	earent power	d. None	[a]
6.	Transmission efficiency increase A. voltage and power factor bo B. B. voltage and power factor C. voltage increases but power D. D. voltage decreases but power D.	th increase both decrease factor decreases	5.		[0]
7	SVC and STATCOM are	devices			[d]
	A. series B. series		C. shunt and	series	D. shunt
8.	SVC stands for A. Static Var Compensator B. B. Static var converter D	. Static voltage con. Static voltage con			[p x
9.	STATCOM is	regulating device.		D. Doyyor f	[]

10.	The main Objective of series compensation A. It improve the power factor B. It reduces the fault currents	[6]
	B. Reduce the voltage drop over long distance D. None	
11.	TCSC is a A. Shunt compensation device B. C. Both A & B B. Series compensation device D. None of the above	[b]
12.	Disadvantage with series compensation A. Reduce the stability B. increase the voltage drop C. Reduce the power factor D. Increase in fault current	[d.X
	Transmission Interconnection is done for A. economic reasons B. to reduce the cost of electricity and C. to improve reliability of power supply: D. All of these	[d]
14.	FACTS controllers can enable a line to carry power closer to its	A and B
15.	What limits the loading capabilityA. Thermal B. Dielectric C. Stability D. All of these	[d]
16.	Basic types of FACTS controller A. Series Controllers and Shunt Controllers B. Combined series-series Control C. Combined series-shunt Controllers D. All of these	[d]
	The voltage fluctuations are largely a consequence of the in series imposformers, and generators. A. Current B. Power C. Voltage drop D. None of these	pedances of lines,
18.	Objectives of Load compensation A. Power-factor correction. B. Improvement of voltage regulation.	[d /
19.	 C. Load balancing D. All of these What is the necessity of compensation? A. Voltage profile B. Power angle characteristics C. Stability margin D. Damping to power oscillations 	[a A
20.	FACTS mainly find application in following areas. A. Power transmission B. Power Quality C. Railway Grid Connection D. Wind power grid Connection	on C

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AI CONTROL TECHNIQUES FOR FACTS DEVICES FROM 01/02/2023TO 17/02/2023 ASSESSMENT TEST Date: 17-2-2023

R	oll Number: <u>일09 기수020</u>	<u>ц</u> Name	of the Student: 13.	Yaswantt	1
No	Time: 20 Min te: Answer the following Q	(Ob uestions and ea	jective Questions) ch question carries on	e mark.	Max.Marks:20
	FACTS devices used in A. Generation B. AC Tran				[a]
2.	Voltage Control means A. Boosting the feeder C. Voltage level within the	voltage B. R allowable limit	educing the Line Volts D. None	age	[C X
3.	Line drop compensation co A. Line drop lagging P		B. Voltage at lead	ing P.F	[0]
4.	C. Transformer voltage dro Which are the shunt compe A. TCSC B. S	nsation?	oltage drop in feeder l	lines D. SVC	[d]
5.	FACTS devices are general A. reactive power B. ac		c, apparent power	_	nission [b]
6.	Transmission efficiency inc A. voltage and power facto B. B. voltage and power fa C. voltage increases but po D. D. voltage decreases but	or both increase actor both decre ower factor dec	ease reases		[a 17
7.	SVC and STATCOM areA. series B. se	eries and shunt	devices. C. shunt an	d series	D. shunt
8.	SVC stands forA. Static Var Compensator B. Static var converter		tage controller		[a]
	STATCOM is	regulating		D. D.	

	The main Objective of series compens A. It improve the power factor	B. It reduces the fault currents	16/
	B. Reduce the voltage drop over long		,
11.		B. Series compensation device D. None of the above	[a]
	Disadvantage with series compensation A. Reduce the stability C. Reduce the power factor	B. increase the voltage drop	
	Transmission Interconnection is done A. economic reasons B. to rec C. to improve reliability of power supp	duce the cost of electricity and	[d]
14.	FACTS controllers can enable a line A. Full efficiency B. Diele	to carry power closer to itsectric rating c. Thermal rating D. Both	A and B
15.	What limits the loading capability A. Thermal C. Stability D. All of these		[]
16.	Basic types of FACTS controller A. Series Controllers and Shunt Controllers C. Combined series-shunt Controllers	rollers B. Combined series-series Contro D. All of these	[d /]
	nsformers, and generators.	a consequence of the in series im C. Voltage drop D. None of these	pedances of lines,
18.	Objectives of Load compensation A. Power-factor correction. B. Impr	rovement of voltage regulation.	[6]
19.	U 1		$\begin{bmatrix} \alpha \\ A \end{bmatrix}$
20.	FACTS mainly find application in foll A. Power transmission B. Pow D. Wind power grid Connection	lowing areas. ver Quality C. Railway Grid Connecti	[^]



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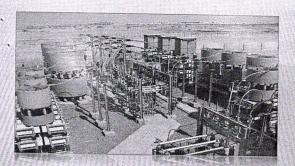
AI CONTROL TECHNIQUES FOR FACTS DEVICES FROM 01/02/2023TO 17/02/2023

ASSESSMENT TEST

Date: 14, 12, 2,

	Roll Number: 109 y 1401 9 Name of the Student: K. Vulkata	Cal
N	Time: 20 Min (Objective Questions) Note: Answer the following Questions and each question carries one mark.	Max.Marks:20
1	. FACTS devices used in A. Generation B. AC Transmission C. DC Transmission D. None	[Q]
2	A. Boosting the feeder voltage B. Reducing the Line Voltage C. Voltage level within the allowable limits D. None	
3	 Line drop compensation corrects for A. Line drop lagging P.F B. Voltage at leading P.F 	[(1)
4	C. Transformer voltage drop D. voltage drop in feeder lines Which are the shunt compensation? A. TCSC B. SSSC C. UPFC D. SVC	[4]
5	A. reactive power B. active power c. apparent power d. None	nission []
6	Transmission efficiency increases as A. voltage and power factor both increase B. B. voltage and power factor both decrease C. voltage increases but power factor decreases D. D. voltage decreases but power factor increases.	[0]
7	. SVC and STATCOM are devices. A. series B. series and shunt C. shunt and series	[D] shunt
8	A. Static Var Compensator B. Static voltage controller B. Static var converter D. Static voltage converter	101
9	. STATCOM is regulating device. A. Current B. Voltage C. Current and Voltage D. Power f	actor

10. The main Objective of series compensation A. It improve the power factor B. It reduces the fault currents B. Reduce the voltage drop over long distance D. None
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20. FACTS mainly find application in following areas. A. Power transmission B. Power Quality C. Railway Grid Connection



VALUE ADDED COURSE ON AI TECHNIQUES FOR **FACTS DEVICES** BY - Mr. M. Bhaskara Reddy Associate Professor, EEE, KSRMCE

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- 12.FIG.-SVC
- 13.TYPES OF SVC
- 14.STATCOM
- 15.FIG.-STATCOM
- 16.UPFC
- 17.FIG.-UPFC
- 18.TEHCNICAL BENEFITS(COMPARISON)
- 19.INFERENCE OF FACTS DEVICES
- 20.APPLICATION
- 21. FUTURE ENHANCEMENT
- 22.CONCLUSION.

PIONEERING IN FACTS

- DR. Narine G. Hingorani is the father of FACTS TENHNOLOGY.
- He worked in bournville power administration
- This is a 500kv, 3phase 60Hz substation.
- C.J.Slatt Substation near Arlington, Oregon



POWER FACTOR AFFECTS TRANSMISSION LINE?

- Presence of thick insulators and long transmission line.
- Improper distribution of load factors.
- For e.g.-inductors are said to consume reactive power & capacitor said to be supply it.
- Improper distribution of these loads causes power factor below one
- CORRECTION- By using facts device, we maintain power factor avoids losses.

LIST OF CONTENTS

- 1.INTRODUCTION
- 2.PIONEERING IN FACTS
- 3.HISTORICAL BACKGROUND
- 4.POWER FACTOR IMPACT ON TRANSMISSION LINE.
- 5.BENEFITS
- 6.NEED OF FACTS DECVICES.
- 7. TYPES OF FACTS.
- 8.FIG.-DIFF.FACTS DEVICES.
- 9.FIG.-SERIES AND SHUNT FACTS.
- 10.STATIC SYCHRONOUS SERIES COMPENSATOR.
- 11.STATIC VAR COMPENSTAOR.

WHAT IS FACTS DEVICES?

- The concept of FACTS (Flexible Alternating Current Transmission System) refers to a family of power electronics-based devices able to enhance AC system controllability and stability and to increase power transfer capability.
- FACTS is defined by the IEEE as "a power electronic based system." and other static equipment that provide control of one or more AC transmission system parameters to enhance controllability and increase power transfer capability."
- According to Siemens "FACTS Increase the reliability of AC grids and reduce power delivery costs. They improve transmission quality and efficiency of power transmission by supplying inductive or reactive power to the grid

HISTORY, CONCEPTS, BACKGROUND, AND ISSUES

- - -Oll Embargo of 1974 and 1979

 - -Environmental Movement
 -Magnetic Field Concerns
 -Permit to build new transmission lines
 -HVDC and SVCs

 - -EPRI FACTS Initiative (1988)
 -Increase AC Power Transfer (GE and DOE Papers)
 -The Need for Power semiconductors
- ansmission interconnection
 -Pool power plants and load centers to minimize generation cost
 -Important in a deregulated environment
- - Increase power transfer capacity SVC (Nebraska GE 1974, Minnesota Westinghouse 1975, Brazil Slemens 1985) TCSC, UPFC AEP 1999

BENEFITS OF FACTS DEVICES

- Better utilization of existing transmission system assets.
- Increased transmission system reliability & availability.
- Increased dynamic & transient grid.
- Stablility & reduction of loop flows.
- Increased quality of supply for sensitive industries.
 - Environmental benefits.

WHY FACTS DEVICES?

The recent development of power electronics, FACTS Tech. provides opportunity to -

- Increase loading capacity of transmission line.
- · Prevent blackouts.
- Improve generation productivity.
- · Reduce circulation reactive power.
- · Reduce damping and oscillations.

FIG.FACTS CONTROLLERS

Different FACTS controllers

(a) General Storage (b) Series controller FACTS controller (FC) Line C dc ac lines Link Link (c) Shunt controller (FC) (b) Shunt controller (FC)

SYNCHRONOUS SERIES COMPENSATOR (SSSC)

- Thyristor-controlled series capacitor (TCSC)- a series capacitor bank is shunted by a thyristor-controlled reactor.
- Thyristor-switched series reactor (TSSR): a series reactor bank is shunted by a thyristor-switched reactor.
- Thyristor-switched series capacitor (TSSC)- a series capacitor bank is shunted by a thyristor-switched reactor.
- Thyristor-switched series reactor (TSSR)- a series reactor bank is shunted by a thyristor-switched reactor.

STATIC VAR COMPENSATOR (SVC)

- Variable Thyristor controlled shunt impedance
 - *Variable reactive power source
 - *Provides ancillary services
 - -Maintains a smooth voltage profile
 - -Increases transfer capability
 - -Reduces losses
 - *Mitigates active power oscillations
 - *Controls dynamic voltage swings under various system conditions

KINDS OF FACTS DEVICES

SERIES COMPENSATION COMPENSATION

SHUNT

TCSC

STATCOM

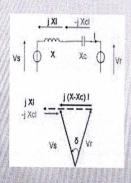
TCSR TSSC

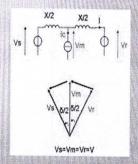
STAT VAR (SVC)
TCR TSR

o TSSR

TSC

FIG.SERIES AND SHUNT FACTS

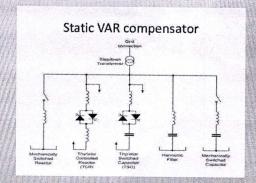




STATIC VAR COMPENSATOR

- It is providing for fast acting reactive power on high voltage electricity transmission network.
- It is used for regulating voltage, power factor, harmonics & stabilizing the system.
- Designed to bring the system closer to unity power factor.

FIG. STATIC VAR COMPENSATOR



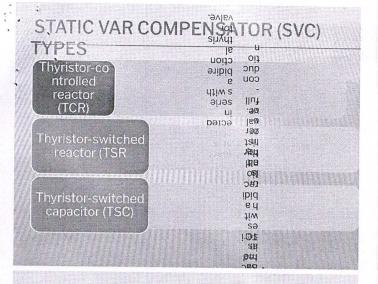


FIG. STATCOM

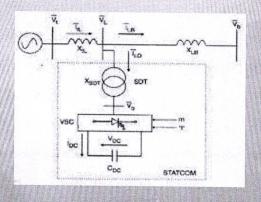
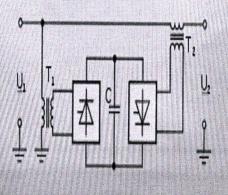


FIG.UNIFIED POWER FLOW CONTROLLER



INFERENCE OF FACTS

MAINTENANCE -

- 1.Minimal & similar to req. shunt capacitor, reactor and X-mer.
- 2. Amount of maintenance ranges-150 to 200 man hrs/yr.

OPERATION-

- 1.Operated automatically.
- 2.Can be done locally and remotely.

STATCOM

- It is a regulating device used on alternating current electricity transmission network.
- a To reduce poor power factor & poor voltage regulation.
- It is based on power electronics voltage source inverter.
- It is acts as either a source or sink of reactive AC POWER.

UNIFIED POWER FLOW CONTROLLER

- Latest in series connected FACTS controllers.
- The UPFC is a combination of a static synchronous series compensator.
- It allows function such as stability control to suppress power system oscillations & transient stability of power stability.

TECHNICAL BENEFITS

DEVICES	LOAD FLOW CONTROL	CONTROL	TRANSIENT	DVNAMIC STABILITY
SVC	LESS	HIGH	LOW	MEDIUM
STATCOM	LESS	HIGH	MEDIUM	MEDIUM
TCSC	MEDIUM	LESS	HIGH	MEDIUM
UPFC	HIGH	HIGH	MEDIUM	MEDIUM

APPLICATION OF FACTS

- Steady state voltage stability.
- Power flow control.
- Damping of power system oscillations.
- Reducing generation costs.
- Hvdc link application.
- Deregulated power system.
- Flicker mitigation.

FUTURE ENHANCEMENT OF FACTS

- Several FACTS devices have been introduced for various application world-wide.
- Number of new types of devices are in the stage of being introduced in practice.
- Many FACTS devices are in under research-
- 1. Hybrid flow controller (HFC)
- 2.Distributed power flow controller(DPFC)
- 3.C-UPFC (centre node).



CONCLUSION

- Due to enhancement of transmission line of power system, we keep increasing the demand as well as with high efficiency which become a sort of designing of new components.
- The development of high power inverter of high performance at low cost is necessary to consolidate compensators as STATCOM, SSSC, UPFC etc
- The areas is to be improved would be as-
- 1.Converter topology.
- 2.Basic control strategies.
- 3. The application of multilevel facts devices.