

Name :

Roll No. :

Invigilator's Signature :

CS / M.TECH (EE) / SEM-2 / PSM-202 / 2011

2011

POWER SYSTEM APPARATUS

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Answer any five questions. $5 \times 14 = 70$

1. What is static synchronous series compensator ? Write down the algorithm of the Newton-Raphson load flow analysis incorporating static synchronous series compensator. 14
2. Draw the equivalent circuit of unified power flow controller. Explain the load flow analysis of a power system having unified power flow controller. 14



3. A 4-bus, 4-transmission line system has the following line data :

Line No.	From bus	To bus	Line impedance (P.U.)	B/2 (P.U)
1	1	4	$0 + j 0.0567$	0
2	2	4	$0.032 + j 0.161$	$j 0.153$
3	3	4	$0.017 + j 0.092$	$j 0.079$
4	2	3	$0.0119 + j 0.0508$	$j 0.1045$

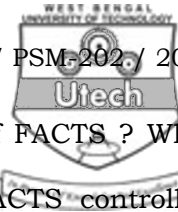
The scheduled bus powers and initial bus voltages are as under :

Bus No.	$P_{cr}(P.U.)$	$Q_{cr}(P.U.)$	$P_D(P.U.)$	$Q_D(P.U.)$	Voltage (P.U.)	Bus type
1	?	?	0	0	1.04	Slack bus
2	1.63	–	0	0	1.025	PV bus
3	0	0	0.85	0.4	1	PQ bus
4	0	0	1.2	0.5	1	PQ bus

A STATCOM operated in voltage control mode is connected to bus 4 to keep the voltage at bus 4 equal to 1.00. The impedance of the STATCOM is $0.01 + j 0.1$.

Find the bus voltages and bus angles after first iteration by Newton-Raphson method.

14



4. What is FACTS ? What are the objectives of FACTS ? What are FACTS controllers ? Classify the FACTS controller. Explain the summary of Loss Versus Var output characteristics of different controller. 14
5. Explain the functional control scheme for the FC-TCR type static Var generator and draw the associated waveforms. 14
6. a) Explain the power flow control by phase angle regulators.
- b) Make a comparison of the UPFC to controlled phase angle regulators. 7 + 7
7. Write short notes on any *four* of the following : $4 \times 3\frac{1}{2}$
- a) VCB
- b) SF_6
- c) Insulation co-ordination
- d) BIL
- e) TSC-TCR.

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