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 × 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 ? Classified that 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 × 3½

   a) VCB

   b) SF_6

   c) Insulation co-ordination

   d) BIL

   e) TSC-TCR.

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