Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/M.Tech (EE)/SEM-2/PSM-201/2012
2012
ADVANCED POWER SYSTEM ANALYSIS

*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 Question No. 1 and any *four* from the rest.

1. a) Explain the physical significance of the elements of the bus-admittance matrix.   3

    b) Differentiate between load flow and state estimation in power system.   3

    c) A shunt capacitor may be represented by two ways for load flow analysis as a constant admittance or as a constant reactive power source. Which option, you think, is better ?   3

    d) Why is symmetrical component representation preferred for fault analysis in power system ?   3

    e) How is optimum power flow different from economic dispatch problem ?   2

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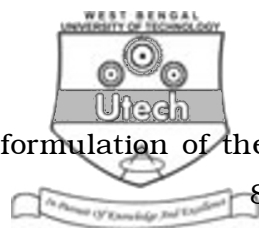
2. a) Justify the assumption made in the formulation of the fast decoupled load flow. 8

   b) Discuss the fast decoupled load flow with the help of a flowchart. 6

3. a) Develop the generalized expression for the fault current and post-fault bus voltage of a power system in terms of the elements of the bus-impedance matrix and fault-admittance matrix. 7

   b) Derive the fault-admittance matrix in symmetrical components for a line-to-line fault. 7

4. a) Formulate the optimum power flow problem and mention its application. 3 + 3

   b) Discuss the optimum power flow algorithm using steepest descent method. 8

5. a) Discuss the features of the rectangular component formulation of the Newton-Raphson load flow. 6

   b) How is the optimum multiplier method used to resolve the load flow problem of ill condition power system ? 8

6. a) Discuss the necessity of state estimation in power system. 3

   b) Derive expression for the weighted least square estimation of the states of a linear system. 8

   c) Why does power system state estimation require iterative approach ? 3
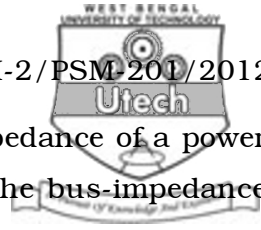
7. The details of the interconnection and impedance of a power system network is as given below. Form the bus-impedance matrix of the network taking bus 4 as reference.

Line No.	Interconnection		Impedance (P. U)
	Bus 1	Bus 2	
1	4	1	0·4
2	4	2	0·3
3	1	3	0·2
4	3	2	0·5

Assume that the transmission lines are not mutually coupled.

8. Write short notes on the following :

a) Constraint handling in linear programming based optimum power flow. 4

b) Cost characteristics of generating units of thermal power plants. 3

c) Necessity of bus classification for load flow analysis. 3

d) Formation of bus-admittance matrix using graph theory. 4