C 27121 (Pages : 2) Name.....

Reg. No.....

EIGHTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION MAY 2012

EE 04 805 (A)—ADVANCED TOPICS IN POWER SYSTEMS

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

1. Derive the transmission loss formula.
2. Explain backward DPP for UC solution.
3. With a flowchart explain the procedure for contingency analysis using sensitivity factors.
4. What are the factors that affect power system security ?
5. Explain the role of state estimator.
6. Explain various state estimation techniques.
7. Explain briefly symmetrical and unsymmetrical fault analysis of large power systems.
8. Find the sequence equivalent circuit when single line to ground fault occurs.

Part B

9. (a) Explain optimal scheduling. (5 marks)

(b) In a two bus system, there are generators in each bus and the load is connected in bus 2. When 100MW is transmitted from plant 1 to the load, loss incurred is 10MW. Find the required generation in each plant and the load power when the system λ is Rs 25/MWh.

The Incremental fuel costs in Rs/MWh for two plants are :

$dC_1/dP_{G1} = 16 + 0.02P_{G1}$, and $dC_2/dP_{G2} = 20+0.04P_{G2}$. (10 marks)

Or

(c) Explain optmal load flow solution with a flow chart. (5 marks)

(d) Incremental fuel costs in Rs/MWh for a plant consisting of two units are :

$dC_1/dP_{G1} = 40 + 0.2P_{G1}$, $30MW < P_{G1} < 175MW$

$dC_2/dP_{G2} = 30+ 0.4P_{G2}$, $20MW < P_{G1} < 125MW$

How will load be shared between the units as the system load varies over the full range of the load values. What are the corresponding values of the plant incremental costs ?

(10 marks)

10. (a) Explain the state estimation by orthogonal decomposition method. (15 marks)

Or

(b) Explain the sequential form of solution of state estimation (15 marks)

Turn over

11. (a) Explain the static state estimation using injection only algorithm. (10 marks)

(b) Explain the need of state estimation techniques. (5 marks)

Or

(c) Explain the state estimation by orthogonal decomposition method. (10 marks)

(d) Explain limitations of line power flow estimator. (5 marks)

12. (a) A three phase generator is connected to a step up transformer and it feeds to a line at the far end of which is a three winding step down transformer. The data is given below. Find fault current and fault MVA when a single line to ground fault occurs at 33kV terminal of three winding transformer.

Generator : 50MVA, 11kV, 3-phase, x_1= 0.4pu, x_2= 0.3pu, x_0= 0.1pu. star connected, star point earthed through 4 Ω resistance.

Step up transformer: 50MVA, 11/132kV, $x_1 = x_2 = x_0$=0.08pu star point earthed.

Line 132 kV, $x_1 = x_2 = 20\ \Omega$, $x_0 = 50\ \Omega$.

Step down transformer: 50MVA, 132/33/3.3kV, 132 kV and 33kV winding solidly earthed and 3.3 kV delta connected. 132 kV, $x_1 = x_2 = x_0$=0.05pu: 33 kV, $x_1 = x_2 = x_0$ = 0.04pu: 3.3 kV, $x_1 = x_2 = x_0$=0.06pu. (15 marks)

Or

(b) A generating station has three generators each of 10MVA capacity connected through reactors of 8% to a common bus bar. If a fault develops on one generator find fault MVA and compare with the case when no reactors are used. (9 marks)

(c) Find the sequence equivalent circuit when two conductors open. (6 marks)