Roll No.:								

B.E. / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2012

ELECTRICAL & ELECTRONICS ENGINEERING BRANCH

SEVENTH SEMESTER

EE 9039 – ADVANCED POWER SYSTEM ANALYSIS

(REGULATIONS 2008)

Time: 3 hr Max. Marks: 100

Answer ALL Questions

PART-A (10 X 2 = 20 Marks)

1. What is multi-area power flow analysis?
2. State at least four applications of power flow studies in the planning and operation of electric power systems.
3. What is the significance of synchronizing torque coefficient?
4. What do you mean by critical clearing time?
5. What is meant by load restoration?
6. What is the effect of shunt compensation on maximum deliverable power?
7. What is sub-synchronous resonance?
8. Explain the operation of dynamic filter used for mitigation of sub-synchronous resonance.
9. What is the need for voltage dependent current order limiter in HVDC link?
10. List any four applications of UPFC.

PART-B (5 X 16 = 80 Marks)

11a. Fig. 11a shows the one-line diagram of a simple three-bus power system with generators at buses 1 and 3. The line impedances are marked in per unit on a 100 MVA base. Find out the bus voltages after one iteration using Fast-decoupled power flow method. (16)

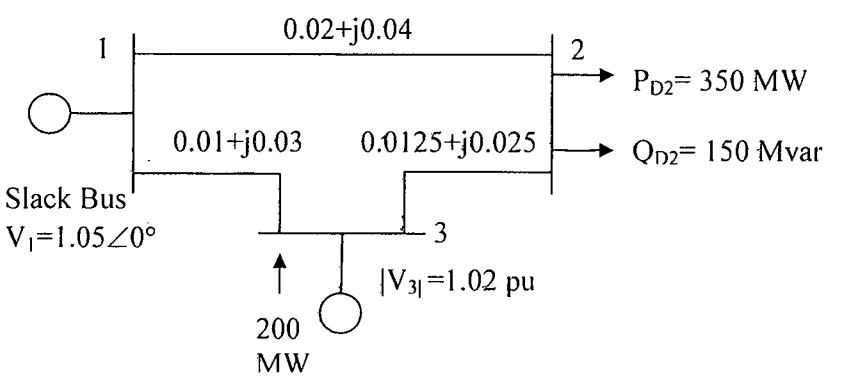

Fig. 11a

12(a) The synchronous machine shown in Fig. Q12a is generating 200 MW and 125 MVAR. The voltage of bus q is 1+j0 pu. The generator is connected to the infinite bus through a line of reactance 0.06 p.u. on a 100 MVA base. The machine transient reactance is 0.2 pu and the inertia constant is 4 pu on a 100 MVA base. The frequency of the supply is 50Hz. For the damping torque coefficient k_D of 5 and -5 determine

(i) Eigen values (6)

(ii) Undamped and damped frequency of rotor oscillations and damping ratio (4)

(iii) Right and Left eigen vectors (6)

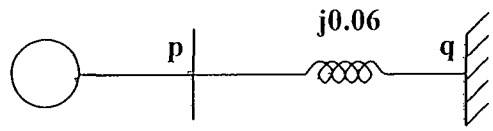

Fig. Q12a

(Or)

(b). The machine data and the line data for the system shown in fig. 12b are given in pu in Tables 12.1 & 12.2, respectively. The load flow data is given in Table 12.3. Using alternating solution approach compute the changes in phase angles of generators at time t= 0.03 s for a three-phase fault at bus 2 which occurs at time t = 0 s and clears itself at 0.1 s. Also the load is rejected at bus 3 at time t =0 s. Take the incremental time (Δt) as 0.03 s. All values are on a 100 MVA base. (16)

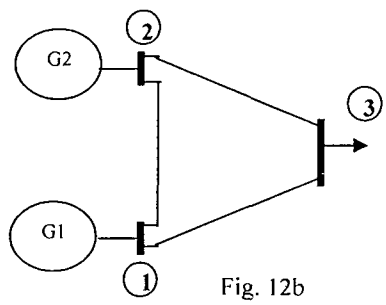

Fig. 12b

Table 12.1 Machine Data

Generator	H in s	X'_d in pu
1	160	0.1
2	3	0.3

Table 12.2 Line Data in pu

Line	Admittance
1-2	- j 5.88
1-3	- j 11.77
2-3	- j 9.17

Table 12.3 Load Flow Results

Bus	Bus Voltage	Generation		Load	
		MW	MVAR	MW	MVAR
1	1.04∠0°	162.14	73.26	0	0
2	1.02∠-3.09°	100	70	0	0
3	0.93∠-7.01°	0	0	250	150