Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER – VII • EXAMINATION – WINTER 2012

Subject code: X 70902 **Date: 27/12/2012**

Subject Name: Inter Connected Power Systems

Time: 10.30 am - 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1

(a) Define steady state stability, transient stability and dynamic stability (6)

(b) Discuss the dynamics of synchronous machine and hence derive the swing equation. (8)

Q.2

(a) Derive SLFE and hence explain classification of buses (7)

(b) What is cascade tripping? Explain cascade tripping and network islanding in brief. (7)

OR

(b) Explain flat selective frequency control and selective frequency control (7)

Q.3

(a) Prove that synchronizing coefficient of a machine should be positive for for system stability (7)

(b) A 50 Hz synchronous generator is connected to an infinite bus through a line. The pu reactances of the generator and line are 0.3 pu and 0.2 pu respectively. The generator no load voltage is 1.1 pu and that of the infinite bus is 1.0 pu. The inertia constant of the generator is 3 MW-sec/MVA. Determine the frequency of natural oscillations if generator is loaded to (i) 60% and (ii) 75% of its maximum power transfer capability and small perturbation in power is given. (7)

OR

Q.3

(a) A synchronous generator delivers power to an infinite bus through a double circuit line. Suddenly there occurs a three phase fault at the generator end of the transmission lines. Derive an expression for critical clearing angle δcr, using equal area criteria. (7)

(b) Two turbo alternators with ratings given below interconnected via a short line have ratings given below (7)

Machine 1: 4 pole, 50Hz, 60 MW, pf 0.8 (lag), Moment of inertia 30000 kg-m^2

Machine 2: 2 pole, 50Hz, 80 MW pf 0.85(lag), Moment of inertia 10000 kg-m^2

Calculate the inertia constant of the single equivalent machine on a base of 200 MVA

Q.4

(a) Explain formulation of Y_{BUS} using singular transformation (7)

(b) Compare NR and GS method of load flow (7)

OR

Q.4

(a) Derive the criteria for most economic dispatch when transmission losses are neglected (7)

(b) Three power plants of total capacity 425 MW are scheduled for operation to supply total load of 300 MW. Find the optimum load scheduling if the plants have the following incremental cost characteristics (7)

$dF_1/dP_{G1} = 30 + 0.15P_{G1}$ $\quad 25 \leq P_{G1} \leq 125$

$dF_2/dP_{G2} = 40 + 0.2P_{G2}$ $\quad 30 \leq P_{G2} \leq 100$

$dF_3/dP_{G3} = 15 + 0.18P_{G3}$ $\quad 50 \leq P_{G2} \leq 200$

Q.5

(a) Describe the turbine speed governing system for controlling the real power flow in the power system (6)

(b) Derive the formula for B-coefficients. State the assumptions made (8)

OR

Q.5

(a) Explain Z_{BUS} algorithm. Discuss how Z_{BUS} gets modified when transmission lines are added between buses. (9)

(b) A system consists of four identical generator units feeding a total load of 1016 MW. The inertia constant of each unit is 5 on 400 MVA base. The load changes by 1.5% for a 1% change in frequency. When there is a sudden drop in load by 16 MW, obtain the power system time constant (Tp) with constants H and D expressed on 1600 MVA base. (5)