Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. - SEMESTER – VII • EXAMINATION – WINTER 2012

Subject code: 170901 Date: 26/12/2012

Subject Name: Inter Connected Power System

Time: 10.30 am - 01.00 pm Total Marks: 70

Instructions:

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

Q.1 **(a)** I. Discuss various methods to improve steady state stability. **04**

II. Explain terms: Cascading (blackouts), Islanding **03**

(b) Form the Y_{BUS} by using singular transformation method for the network shown in Fig 1 including the generator buses. **07**

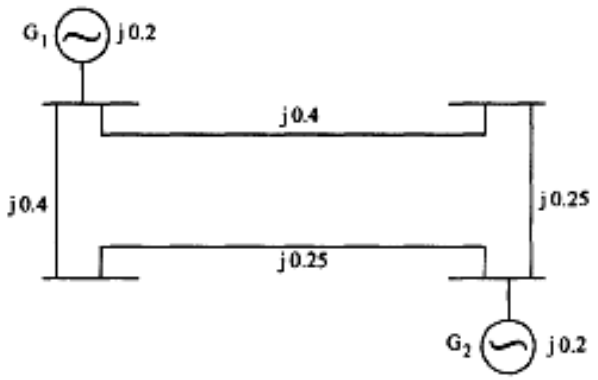

Figure 1

Q.2 **(a)** Discuss advantages and limitations of Gauss-Siedel and Newton-Raphson methods. Of the two, which method is generally preferred for solving load flow problem? **06**

(b) Discuss the algorithm of load flow solution using Newton-Raphson method for all type of buses. **08**

OR

(b) Figure 2 shows the one line diagram of simple three bus power system with generator at buses 1 & 3. The magnitude of voltage at bus 1 is adjusted to 1.05 pu. Voltage magnitude at bus 3 is fixed at 1.04 pu with real power generation of 200 MW. A load consisting of 400 MW and 250 Mvar is taken from bus 2. Line impedances are marked in pu on 100 MVA base, and line charging susceptances are neglected. Obtain Gauss-siedel power flow solution for 2 iteration. **08**

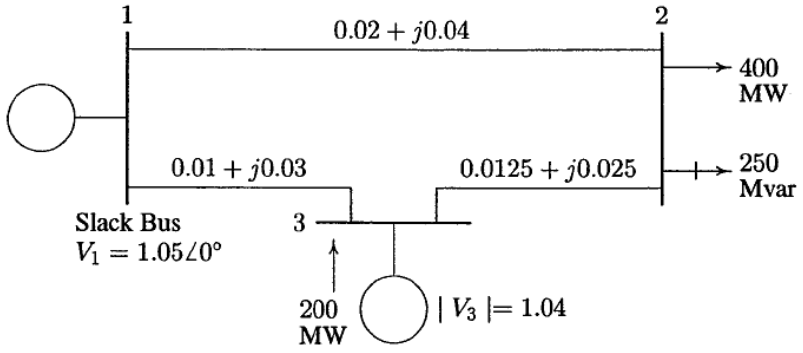

Figure 2 [PTO]

Q.3 **(a)** Discuss procedure for solving the swing equation using point by point method. **07**

(b) A 100 MVA, 2 pole, 60 Hz generator has a moment of inertia 50x10 kg.m^3. (a) What is energy stored in the rotor at rated speed? (b) What is the corresponding angular momentum? (c) Determine the inertia constant H. (d) If the input to the generator is suddenly increased by 25 MW, determine the rotor acceleration. **07**

OR

Q.3 **(a)** How can the transient stability of a system be improved? Discuss the traditional as well as new approaches to the problem. **07**

(b) A synchronous motor is receiving 35% of the power that it is capable of receiving from an infinite bus. If the load on the motor is doubled, determine the maximum value of load angle δ during the swinging of motor around its new equilibrium position using equal area criteria. **07**

Q.4 **(a)** Show that when number of generating units are operating in parallel and supplying power into a transmission network, the most economical scheduling of load is obtained when their incremental cost of received power are equal. Derive an equation coordinating the incremental cost of production, the incremental transmission loss and the incremental cost of received power. **07**

(b) Incremental fuel costs in dollars per megawatthour for a plant consisting of two units are given by **07**

$$\lambda_1 = \frac{dF_1}{dP_{g_1}} = 0.008\, P_{g_1} + 8.0 \qquad \lambda_2 = \frac{dF_2}{dP_{g_2}} = 0.0096\, P_{g_2} + 6.4$$

Assume that both units are operating at all times, that total load varies from 250 to1250 MW, and that maximum and minimum loads on each unit are to be 625 and 100 MW, respectively. Find the incremental fuel cost of the plant and the allocation of load between units for the minimum cost of various total loads.

OR

Q.4 **(a)** Write short note on unit commitment. **07**

Q.4 **(b)** A two bus system is shown in figure 3. If 100 MW is transmitted form plant 1 to the load, a transmission loss of 10 MW is incurred. Find the required generation for each plant and the power received by the load when the system λ is Rs 25/MWh. **07**

$\frac{df_1}{dP_{g_1}} = 0.02\ P_{g_1} + 16.0$ Rs/MWh, $\frac{df_2}{dP_{g_2}} = 0.04\ P_{g_2} + 20.00$ Rs/MWh

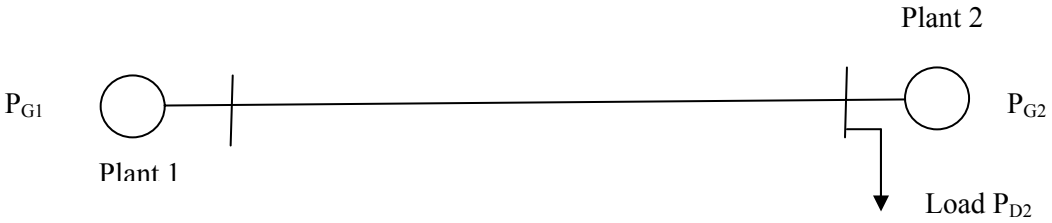

Figure 3

Q.5 **(a)** Describe speed governing system for controlling real power flow in the system. **07**

(b) Explain automatic load dispatch in power system. **07**

OR **[PTO]**

Q.5 **(a)** Explain fully the flat frequency control method and selective frequency control methods used for controlling frequency in single/two area power system. **07**

(b) Explain methods used for voltage control in power systems. **07**

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