Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
M.E Sem-I   Examination January 2010
Subject Code: 710701
Subject Name: Power System Modeling and Simulation

Date: 20 / 01/ 2010   Time: 12.00 – 2.30 pm
   Total Marks: 60

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

Q.1 **(a)** Describe the steps for formation of [Ybus] using singular transformation **06** method. ([Ybus] = A^T Y A). Also explain when [Ybus] becomes symmetrical and when it becomes unsymmetrical.

(b) A three bus system is shown in Fig. Each line has series imp of (0.05+j0.15) **06** p.u. and shunt admittance is neglected find [Ybus]. Also find the modified [Ybus] when bus no. 4 is to be added to bus no 3 through a line of Z=0.1+0.3 p.u.
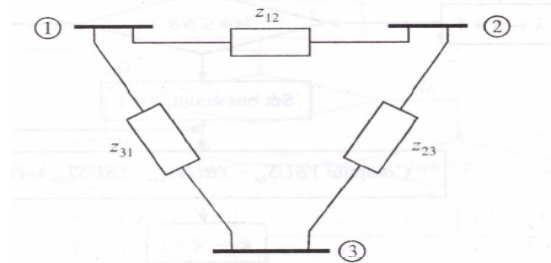
Q.2 **(a)** Explain how static load flow equations are solved using N-R method? **06** Discuss how the reactive power limits hit by the sources at the PV bus is handled in this method of Load Flow Solution?

(b) What is Continuation Power Flow (CPF)? How it is different from the **06** normal load flow? What additional information is required for & available from the CPF?

OR

(b) For the system shown in Fig. where bus no.1 is ref bus and bus no 2 and 3 **06** are the load buses. Scheduled complex loads (Q inductive) and required elements of [Ybus] (in p.u.) are marked on the line diagram). Find the voltages at load buses after first iteration using G S method.
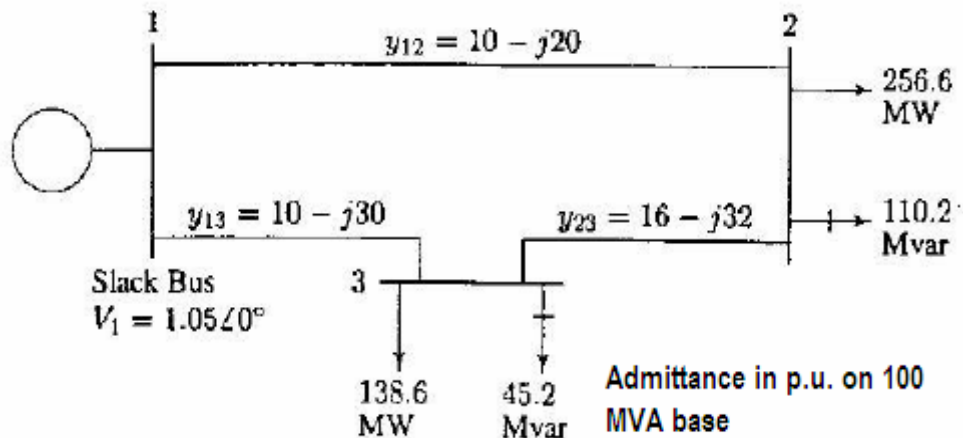
Q.3 **(a)** Explain the following terms in details in context to power system security **06** (1) Monitoring (2) Analysis (3) Optimization.

(b) Explain corrective security enhancement and preventive security enhancement. **02**

(c) Draw security state block diagram and explain each state in detail. **04**

OR

Q.3 (a) Derive expressions for Line outage distribution factors and generator shift factors **06**

**(b)** A 4 Bus system with Z bus given in p. u. by **06**

$$
\begin{array}{c}
 & \text{①} \quad \text{②} \quad \text{③} \quad \text{④} \\
\begin{array}{c}\text{①}\\\text{②}\\\text{③}\\\text{④}\end{array}
\begin{bmatrix}
j0.041 & j0.031 & j0.027 & j0.018 \\
j0.031 & j0.256 & j0.035 & j0.038 \\
j0.027 & j0.035 & j0.158 & j0.045 \\
j0.018 & j0.038 & j0.045 & j0.063
\end{bmatrix}
\end{array}
$$

has bus Voltage $V_1 = 1.0\underline{/0°}$, $V_2 = 0.98\underline{/0°}$, $V_3 = 0.96\underline{/0°}$, and $V_4 = 1.04\underline{/0°}$. Determine the change in voltage at bus 2 due to the outage of line 1-3 with series impedance j0.3 p.u.

Q.4 (a) What is State Estimation? Differentiate SE and Load Flow **04**

(b) Derive the formula for state estimation based on weighted least square method. Explain how underdetermined problems are handled in power system state estimation. **08**

OR

Q.4 (a) Explain network obsevability and pseudo measurement in context with the state estimation in power system **04**

(b) For the DC circuit shown in the Fig. the meter readings are z z_1= 9.01 amp, $z_{2=}$ 3.02 amp z_3 = 6.98 V and z_4 = 5.01 V **08**
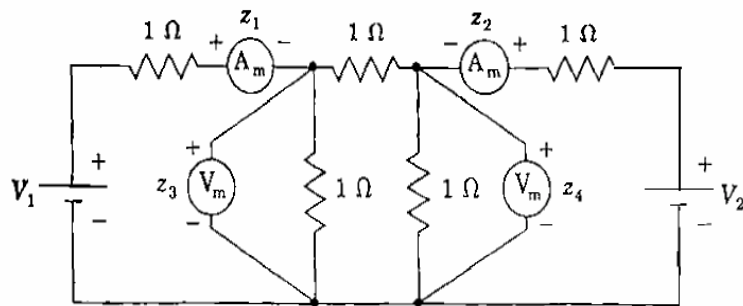
(Ammeters measuring z_1,z_2 and voltmeters measuring z_3, z_4) Assuming that Ammeters are more accurate than voltmeters assigned measurement weights are w_1= 100, w_2=100 w_3 = 50 and w_4=50. Determine the weighted least square estimates of voltage sources V_1 and V_2.

Q.5 (a) Compare backward Euler's method and trapezoidal method in context to application of these methods to the large scale power systems. **04**

(b) Explain how Ybus is modified and obtained for pre-fault and post-fault conditions of the network for the transient stability study. **04**

(c) Write notes on traveling waves on transmission line **04**

OR

Q.5 (a) Describe the method of obtaining L (Lower Triangular) and U Upper Triangular) Matrices in LU Factorization **04**

(b) Discuss How ordering scheme is useful for sparse matrix solution using triangular factorization. Using an appropriate example, show that the number of multiplication and divisions is being reduced by the optimal ordering scheme. **08**

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