EEL 456
MAJOR EXAMINATION – 2008

Time : 02 Hrs **F.M. – 100**

(There are three sections and answer in section wise)

SECTION – A (Approximately 1 Hr and for 50 Marks)

1. Find the generalized analytical formula for the incremental fuel cost, when N generating units are committed to supply a load demand of P_D. Assume the cost curve of the generator as a standard quadratic cost function of power generated by the generator. Neglect the losses. [10]

2. A two bus system without generating limits has the following characteristics

   $\frac{dC_1}{dP_1} = 0.006P_1 + 4$ and $\frac{dC_2}{dP_2} = 0.007P_2 + 4$

   $P_{Loss} = 0.008(P_2 - 100)^2$

   The load demand at bus 1 and 2 are 400Mw and 100MW respectively
   Find the optimal generation of each plant and power loss in the line. [10]

3. Describe the classical method of solution of optimal power flow. Briefly explain the steps involved for problem formulation and solution method. [15]

4. Explain the voltage stability problem. Find the classical equation to draw the PV curve of a radial system and draw the PV curves at different loading conditions. Explain the terms critical power. [15]

SECTION – B (Approximately 30 Minutes and for 25 Marks)

5. A 100 MW unit with 0.05 p.u. turbine regulation operates in parallel with a 500 MW unit with identical turbine regulation. For a specific amount of power demand increase, find the ratio of sharing of the load by the units if the system frequency is 50 Hz. [5]

6. What do you mean by ALFC. Derive the block diagram of primary ALFC loop. Explain the role of secondary ALFC loop. [20]

SECTION – C (Approximately 30 Minutes and for 25 Marks)

Make a choice between Q7 or (Q8A+Q8B)

7. Solve one iteration of Gauss-Seidel Algorithm for a 3 bus system given in Fig. 1. The line data is as follows (values in per unit):

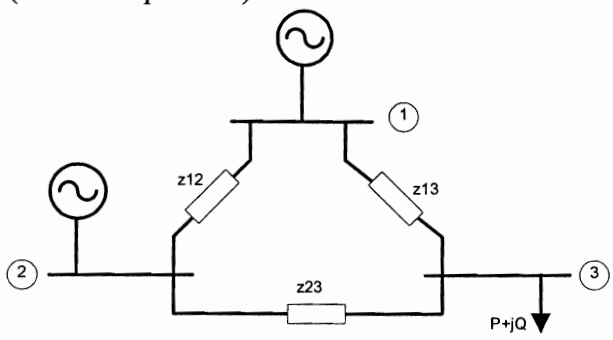

Figure 1

$z_{12} = 0 + j0.03 \qquad z_{13} = 0 + j0.02 \qquad z_{23} = 0 + j0.025$

Bus 1: Slack Bus	**Bus 2: PV Bus**	**Bus 3: PQ Bus**
$\lvert V_1 \rvert^{spec} = 1.05 pu$	$\lvert V_2 \rvert^{spec} = 1.00 pu$	$P_3^{spec} = -7.0 pu$
$\delta_1^{spec} = 0$	$P_2^{spec} = 3.0 pu$	$Q_3^{spec} = -3.0 pu$

Use 'flat start' as initial guess. Determine the magnitude and angle of V_2, V_3 at the end of iteration 1. **[25]**

OR

Q8A: Consider 4 bus system of Fig. 2.

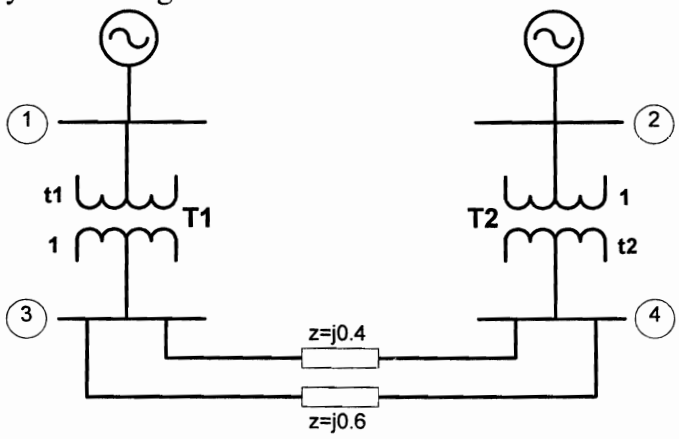

Figure 2

Transformers T_1 and T_2 have tap ratios t1:1 and 1:t2 as shown in the figure. The leakage reactance of T_1 in pu is $X_{t1} = j0.012$ and that of T_2 is $X_{t2} = j0.06$. The tap ratios are: $t_1 = 0.85$ and $t_2 = 1.0\angle 5^\circ$. Obtain the *Ybus*.

Q2B: Find *Ybus* for the system given in Fig. 1. State, whether the *Ybus* will be singular or not.