

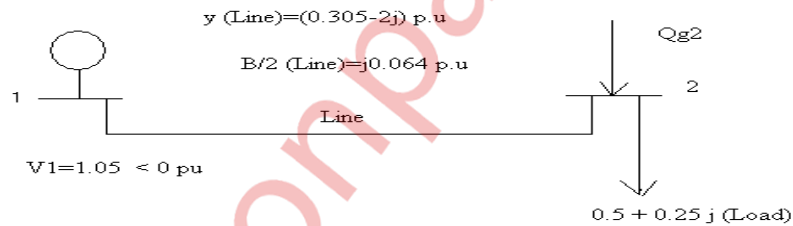
(3 Hours)

Total Marks: 80

NOTE

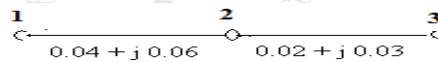
1. Question number 1 is compulsory
2. Attempt any three from the remaining
3. Figures to right indicates full marks
4. Assume suitable data if necessary and mention the same

1. Attempt any four of the following :- 20
 - a) Explain why frequency control loop and voltage control loop are not interacting 05
 - b) Explain different properties of Ybus 05
 - c) Define power system stability and classify it on the basis of nature of disturbance 05
 - d) State assumptions made in transient stability studies 05
 - e) Admittance matrix of a 20-bus power network has 80% elements as zero. 05
How many minimum number of transmission lines are there in this system
2. 20
 - a) A simple two-bus power system is shown in fig 10



$|V_2| = 1.0$ p.u. (Bus 2 is PV bus). Obtain δ_2 and Q_{g2} at the end of first iteration of N-R method.

- b) For the network shown in figure obtain the complex bus bar voltage at bus 2 10
at the end of the first iteration. Use the Gauss seidal method. Line impedances are given in pu Given Bus 1 is slack bus with $V_1 = 1 < 0$
 $P_2 + j Q_2 = -5.6 + j 1.46$ Assume $V_3^0 = 1.02 < 0$ $V_2^0 = 1 < 0$



3. 20
 - a) Determine the economic operation point for three thermal units delivering 10
a total load of 600 MW with considering generator limit
Unit1 Pmax=600 MW Pmin=150 MW
 $F_1(P_1) = 550 + 7.7 P_1 + 0.00165 P_1^2$
Unit2 Pmax=500 MW Pmin=125 MW
 $F_2(P_2) = 300 + 7.88 P_2 + 0.002 P_2^2$
Unit3 Pmax=600 MW Pmin=75 MW

$$F_3(P_3) = 80 + 7.99 P_3 + 0.005 P_3^2$$

- b) The incremental fuel cost of a plant, three-generation unit is 10
 $IC_1 = 10 + 0.4P_1$, $IC_2 = 40 + 0.3P_2$, $IC_3 = 50$
 , All units operated all the time if the plant is operating on economic load
 dispatch to supply the total demand of 750MW. $50MW \leq P_1, P_2, P_3 \leq 300MW$
 What is the power generated by each unit?

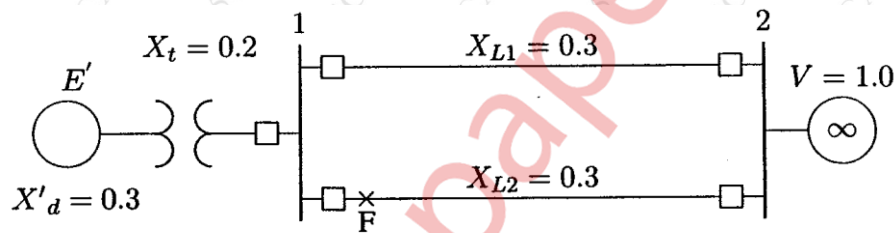
4. 20

a) Derive Equal area criterion 10

b) A 50 Hz synchronous generator having inertia constant $H = 5$ MJ/MVA and 10

a direct axis transient reactance $x_d' = 0.3$ p.u is connected to an infinite bus
 through a purely reactive circuit as shown in the figure below. Reactances
 are marked on the diagram on a common system base. The generator is
 delivering real power $P_e = 0.8$ pu and $Q = 0.074$ pu to the infinite bus at
 voltage $v = 1$ pu. A temporary three phase fault occurs at the sending end of
 the line at point F. When the fault is cleared, both the lines are intact.

Determine the critical clearing angle and the critical clearing time



5. 20

a) Draw turbine speed governor system and explain briefly 4 major parts in it 10

b) Explain dynamic response of change in frequency for step change in load of 10
 an isolated power system. How dynamic response changes with integral
 control action

6. Write short notes on 20

a) power pool and its advantages and disadvantages 10

b) System state classification of power system security 10