

Duration: 3 Hours

Total Marks: 80

Note: 1. Q. 1 is compulsory.

2. Solve any 3 questions out of remaining questions.

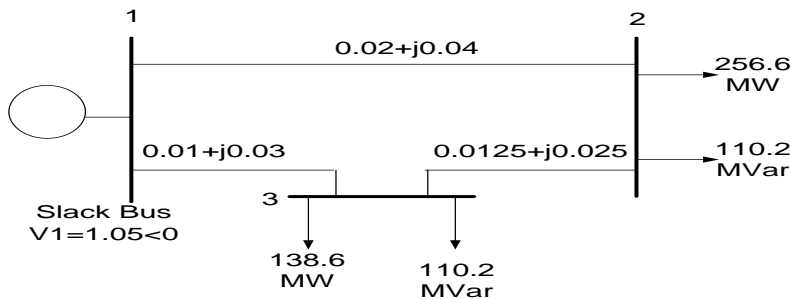
3. Assume suitable data if necessary.

Q1) [20]

- Write down the classification of buses for load flow analysis.
- Draw input-output curve, heat rate and IFC curve of a generating unit.
- What are the assumptions made in transient stability studies?
- How the equal area criterion can be used for stability analysis.

Q2)

- Figure shows the one line diagram of a simple three bus power system with generation at bus 1. The magnitude of voltage at bus 1 is adjusted to 1.05 p.u. The scheduled loads at buses 2 and 3 are as marked on the diagram. Line impedances are marked in per unit on a 100 MVA base and the line charging susceptances are neglected. Using Gauss-Seidel method calculate V_2^1 and V_3^1 . [10]



- Derive the swing equation for a synchronous machine that describes the rotor dynamics. [10]

Q3)

- Two generating units are operating in parallel Incremental fuel cost in rupees per MWh for a plant consisting of two units are:

$$dC_1/dP_{G1} = 0.20P_{G1} + 40 \quad 30\text{MW} \leq P_{G1} \leq 175\text{MW}$$

$$dC_2/dP_{G2} = 0.40P_{G2} + 30 \quad 20\text{MW} \leq P_{G2} \leq 125\text{MW}$$

How will the load be shared between the two units as the system load varies from minimum to maximum? What is the corresponding incremental cost? [10]

- Compare GS and NR method of load flow studies. [10]

Q4)

- a. A 60Hz generator is delivering 50% of maximum permissible power through a transmission system to an infinite bus. A fault occurs and causes transfer reactance to increase to 400 % of the value before fault. When the fault is isolated and the maximum power transfer is 75% of the original maximum value. Determine the critical clearing angle using equal area criterion. [10]
- b. Explain automatic voltage control [10]

Q5)

- a. Explain proportional plus integral load frequency control and plot dynamic response of the controller with and without integral control action [10]
- b. Derive the expression for the exact coordination equation. [10]

Q6) Write short notes on (any three) [20]

- a. Power pool and transactions
- b. Optimal Unit commitment and reliability considerations
- c. AGC in restructured power system
- d. P-V curve for voltage stability analysis
