

2125
M.E. Electrical Engineering (Power System)
First Semester
EE (PS)-8101: Advanced Power System Analysis

Time allowed: 3 Hours

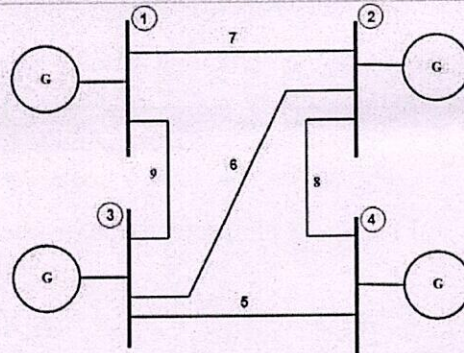
Max. Marks: 50

NOTE: Attempt any five questions. Missing data (if any) can be appropriately assumed.
x-x-x

Q1. Explain briefly

- A) Write the important aspects that need to be considered for power flow analysis. (2)
- B) Define graph and sub-graph of the network with suitable example. (2)
- C) Draw the flow chart for Newton-Raphson method for load flow analysis. (2)
- D) Define the hessian matrix used in state estimation. (2)
- E) Differentiate balanced and unbalanced three phase faults in power system. (2)

- Q2.A)** Prove that in bus admittance matrix diagonal elements are equal to the sum all the admittances connected at node i and off diagonal elements are equal to minus of the admittance connected between node i and j. (5)
- B)** Obtain the oriented graph for the system shown in Fig. below. Select any four possible trees. For a selected tree show the basic loops and basic cut-sets. (5)



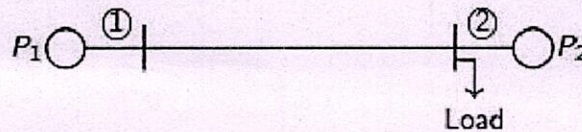
- Q3. A)** Compare G-S method and N-R method of load flow solutions. (5)
- B)** Consider the three-bus system as shown in figure below. Each of the three lines has a series impedance of $0.02+j0.08$ pu and a total shunt admittance of $j0.02$ pu. the specified quantities at the buses are tabulated below: (5)

Bus No.	Voltage Specification	Real Power Generation P_{Gen}	Reactive Power Generation Q_{Gen}	Real Load Demand P_{Dem}	Reactive Load Demand Q_{Dem}
1	$V_1 = 1.04 + j0$ (Slack bus)	Unspecified	Unspecified	2.0	1.0
2	Unspecified (PQ bus)	0.5	1.0	0.0	0.0
3	$V_3 = 1.04$ (PV bus)	0.0	$Q_{G3} = ?$	1.5	0.6

Controllable reactive power source is available at bus 3 with the constraint pu. Calculate the first iteration load flow solution using the FDLF method.

(2)

- Q4.A)** What are the additional constraints needed to include for ac-dc power flow? Explain about per unit system for DC quantities. (5)
- B)** Explain the variable elimination method of DC power flow. (5)
- Q5. A)** For the system shown in figure determine the line flows using DC load flow method. Take base MVA as 100. The values shown in figure are per unit line reactances. (5)
- B)** Explain the effects of transmission losses in economic load dispatch problem. (5)
- Q6. A)** What are the different types of faults that can occur in power system? Discuss the techniques which can be used for symmetrical fault analysis. (5)
- B)** Describe Least Square Estimation (LSE) and Weighted LSE for estimation of x (vector of n random variables) using another vector y of variables m ($>n$). (5)
- Q7.** Consider a two bus system shown below (10)



The incremental fuel cost characteristics of plant 1 and plant 2 are given by

$$dF_1/dP_1 = 0.025P_1 + 14 \text{ Rs/MWH}$$

$$dF_2/dP_2 = 0.05P_2 + 16 \text{ Rs/MWH}$$

If 200 MW of power is transmitted from plant 1 to the load, a transmission loss of 20 MW will be incurred. Find the optimum generation schedule and the cost of received power for a load demand of 210 MW.

(5)

- Q8.A)** Explain the sequential method of DC power flow? (5)
- B)** Derive the expression for the fault current and terminal voltage for a line to line fault occurs at the terminal of an unloaded 3-phase alternator. Assume that the alternator has an isolated neutral. (5)