For the power system network shown:

Develop a Matlab program to solve the power flow for the system using Newton Raphson technique to get the bus voltages, the slack bus power, power flows and power losses.

SYSTEM PARAMETERS

Line. bus to bus 1-2

Series Z: [R per unit= 0.01008] [X per unit = 0.05040]

Series Y=Z^-1: [G per unit= 3.815629] [B per unit = - 19.078144]

Shunt Y: [Total charging MVAR= 10.25] [Y/2 per unit = 0.05125]

Line. bus to bus 1-3

Series Z: [R per unit= 0.00744] [X per unit = 0.03720]

Series Y=Z^-1: [G per unit= 5.169561] [B per unit = -25.847809]

Shunt Y: [Total charging MVAR= 7.75] [Y/2 per unit = 0.03875]

Line. bus to bus 2-4

Series Z: [R per unit= 0.00744] [X per unit = 0.03720]

Series Y=Z^-1: [G per unit= 5.169561] [B per unit = -25.847809]

Shunt Y: [Total charging MVAR= 7.75] [Y/2 per unit = 0.03875]

Line. bus to bus 3-4

Series Z: [R per unit= 0.01272] [X per unit = 0.06360]

Series Y=Z^-1: [G per unit= 3.023705] [B per unit = -15.118528]

Shunt Y: [Total charging MVAR= 12.75] [Y/2 per unit = 0.06375]

Base values for per unit representation: 100MVA, 230 kV. At 230 kV.

POWER VALUES

Bus 1

Generation: [P, MW = 0] [Q, Mvar = 0]

Load: [P, MW = 50] [Q, Mvar = 30.99]

V, per unit: 1.00∠0°

Remarks: Slack bus

Bus 2

Generation: [P, MW = 0] [Q, Mvar = 0]

Load: [P, MW = 170] [Q, Mvar = 105.35]

V, per unit: 1.00∠0°

Remarks: Load bus (inductive)

Bus 3

Generation: [P, MW = 0] [Q, Mvar = 0]

Load: [P, MW = 170] [Q, Mvar = 105.35]

V, per unit: 1.00∠0°

Remarks: Load bus (inductive)

Bus 4

Generation: [P, MW = 318] [Q, Mvar = 0]

Load: [P, MW = 80] [Q, Mvar = 49.58]

V, per unit: 1.02∠0°

Remarks: Voltage controlled