**1.**

a) Thévenin equivalent of right system: $V_{TH}$=1 p.u., $Z_{TH}$=j0.15+j0.25=j0.4 p.u. $S_{SC}=|V_{TH}^2/Z_{TH}|$=1/0.4=2.5 p.u. or 2.5 p.u.*100MVA=**250 MVA**

b) Consider one phase: Load current $I_{load}$=1 p.u. @ p.f. 1 =1+j0 p.u. Line-neutral voltage drop across $Z_{TH}$ is $\Delta V=Z_{TH}I_{load}$=j0.4*1 p.u. With resistive load (p.f.=1), $V_4$ and ΔV differ by 90° so that $V_{TH}^2 = V_4^2 + (\Delta V)^2$. Magnitude of bus voltage $V_4=\sqrt{V_{TH}^2 - (\Delta V)^2} = \sqrt{1^2 - 0.4^2}$ = **0.92 p.u.**

c) Thévenin equivalent of left system seen from bus 2: $V_{TH}$=1 p.u., $Z_{TH}$=(j0.1+j0.15)//(j0.2+j0.1) p.u.=0.136 p.u.
Thévenin equivalent of entire system seen from bus 4 after interconnection: $V_{TH}$=1 p.u., $Z_{TH}$=(j0.136+j0.1)//(j0.15+j0.25) p.u.=0.149 p.u.
$S_{SC}=|V_{TH}^2/Z_{TH}|$=1/0.149=6.73 p.u. or 6.73 p.u.*100MVA=**673 MVA**

d) Load current same as in 1b. Line-line voltage drop across $Z_{TH}$ is ΔV=j0.149*1 p.u. Magnitude of bus voltage $V_4=\sqrt{V_{TH}^2 - (\Delta V)^2} = \sqrt{1^2 - 0.149^2}$ = **0.99 p.u.**

**2.**

a) Voltage at both generator buses is 1 p.u. so $V_{TH}$=1.0 p.u. $Z_{TH}$ is the impedance to ground from bus 3 with the (generator) voltage sources set to 0: $Z_{TH}$=j0.2//j0.25=j0.11 p.u. $S_{SC}=V_{TH}^2/Z_{TH}$=9.0 p.u. or **900 MVA**.

b) $\partial V \approx -\partial Q/S_{SC}$=–(–50/100)/9.0 p.u.=+0.056 p.u. The new voltage will be approximately 0.923+0.056 p.u. =**0.979 p.u.**