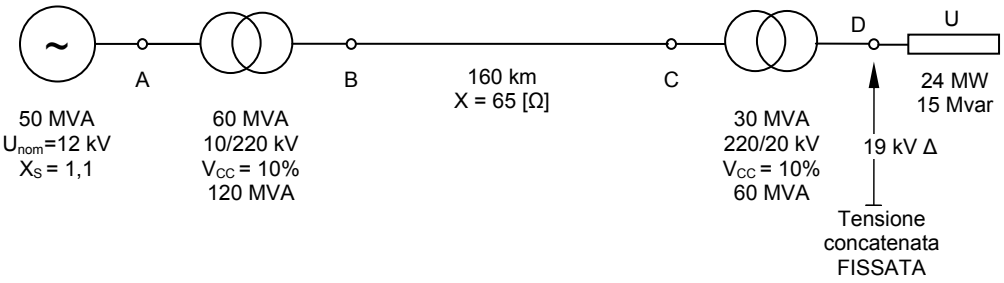
ESEMPIO METODO P.U.
Esercizio Numero 2
PAG. 135 libro del prof. Antonio Paolucci



GENERATORE	TRAFO1	LINEA	TRAFO2 CARICO
$X_S = \frac{1{,}1 \cdot 12000^2}{50 \cdot 10^6} = 3{,}168\,[\Omega]$	$X_{T1} = \frac{0{,}1 \cdot 20000^2}{60 \cdot 10^6} = 0{,}667\,[\Omega]$	$X_L = 65 \cdot \left(\frac{20}{220}\right)^2 = 0{,}53719\,[\Omega]$	$X_{T2} = \frac{0{,}1 \cdot 20000^2}{30 \cdot 10^6} = 1{,}33\,[\Omega]$
$X_S = \frac{3{,}168}{\left(\frac{10}{20}\right)^2} = 12{,}672\,[\Omega]$ Impedenza riferita a 20 kV			$r = \frac{19000^2}{26 \cdot 10^6} = 15{,}042\,[\Omega]$
			$x = \frac{19000^2}{15 \cdot 10^6} = 24{,}066\,[\Omega]$

$$Z_{TOT} = jX_S + jX_{T1} + jX_L + jX_{T2} = jX_{TOT} = j15{,}21\,[\Omega]$$

$$I_{caricoA} = \frac{24 \cdot 10^6}{\sqrt{3} \cdot 19000} = 729\,[A]$$

$$I_{caricoR} = \frac{15 \cdot 10^6}{\sqrt{3} \cdot 19000} = 455{,}8\,[A]$$

Tensione interna di macchina (riferita a 20 kV)

$$E_S = E_D + jX_{TOT} \cdot I_{CAR}$$

$$E_{S\_20kV} = \frac{19000}{\sqrt{3}} + j15{,}21 \cdot (729 - j455{,}8) = 17{,}90 + j11{,}088\,[kV]$$

$$E_{S\_10kV} = \frac{17{,}90 + j11{,}088}{2} = 8{,}95 + j5{,}544\,[kV]$$

E in corto circuito in D? (mantenendo la tensione a 19 kV concatenati)

$$\underline{z}_{eq} = \frac{1}{\left(\frac{1}{r}\right)+\left(\frac{1}{jx_{carico}}\right)+\left(\frac{1}{jx_{tot}}\right)} = 4{,}17 - j6{,}73\ [\Omega]$$

$$I_{cc3f} = \frac{19000}{\sqrt{3}\cdot(4{,}13 + j6{,}83)} = 729 - j1177\ [A]$$

E in p.u. cosa succede?

N_{base}(trifase) = 60 MVA

$E_{base1} = \frac{10000}{\sqrt{3}}$	$E_{base2} = \frac{220000}{\sqrt{3}}$	$E_{base3} = \frac{20000}{\sqrt{3}}$
$I_{base1} = \frac{N_{base}}{3E_{base1}} = 3464\ A$	$I_{base2} = \frac{N_{base}}{3E_{base2}} = 157{,}45\ A$	$I_{base3} = \frac{N_{base}}{3E_{base3}} = 1{,}73\ kA$
$Z_{base1} = \frac{E_{base1}}{I_{base1}} = 1{,}66\ \Omega$	$Z_{base2} = \frac{E_{base2}}{I_{base2}} = 806\ \Omega$	$Z_{base3} = \frac{E_{base3}}{I_{base3}} = 6{,}66\ \Omega$

$e_d = \frac{E_D}{E_{base3}} = \frac{19000/\sqrt{3}}{E_{base3}} = 0{,}95\ p.u.$	$x_L = \frac{65}{806} = 0{,}081\ p.u.$
$x_s = \frac{X_S}{Z_{base1}} = \frac{3{,}168}{1{,}66} = 1{,}91\ p.u.$	$x_{tot} = 2{,}229\ p.u.$
$x_{T1} = \frac{0{,}1\cdot 220000^2}{60\cdot 10^6}\cdot\frac{1}{806} = 0{,}1\ p.u.$	$n_d = \frac{24 + j15}{60} = 0{,}4 + j0{,}25\ p.u.$
$x_{T2} = \frac{1{,}33}{6{,}66} = 0{,}2\ p.u.$	$n_d = e_d \cdot \check{i}_d \Rightarrow i_d = \frac{\check{n}_d}{\check{e}_d} = \frac{0{,}4 - j0{,}25}{0{,}95} = 0{,}42 - j0{,}263\ p.u.$

$r = \frac{e_d^2}{p} = \frac{0{,}95^2}{0{,}4} = 2{,}25625\ p.u.$	$x = \frac{e_d^2}{q} = \frac{0{,}95^2}{0{,}25} = 3{,}61\ p.u.$
$e_s = e_d + jx_{tot}\cdot i_d = 0{,}95 + j2{,}29\cdot(0{,}42 - j0{,}263) = 1{,}55 + j0{,}962\ p.u.$	
$E_s = e_s \cdot E_{base1} = (1{,}55 + j0{,}962)\cdot\frac{10000}{\sqrt{3}} = (8{,}96 + j5{,}55)\ kV$	

E in corto circuito in D? (mantenendo a 19 kV concatenati)

$$\underline{z}_{eq} = \frac{1}{\left(\frac{1}{r}\right)+\left(\frac{1}{jx_{carico}}\right)+\left(\frac{1}{jx_{tot}}\right)} = 0{,}627 + j1{,}01 \text{ p.u.}$$

$$i_{cc3f} = \frac{e_d}{\underline{z}_{eq}} = \frac{0{,}95}{0{,}627 + j1{,}01} = 0{,}421 - j0{,}678 \text{ p.u.}$$

$$I_{cc3f} = \underline{i}_{cc3f} \cdot I_{base3} = 729 - j1174 \,[A]$$