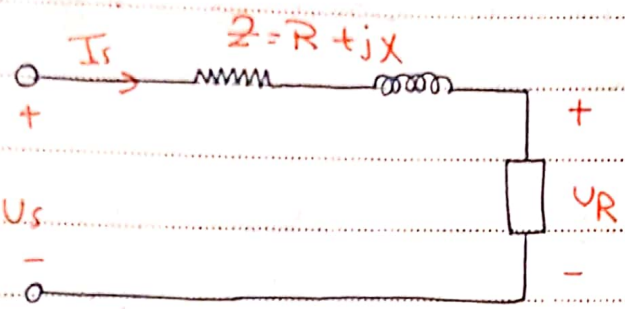
Subject : chapter (4). 31 / 3 / 2019.



S: Sending.

R: recieving.

* $V_S = V_R + (I_R * Z)$

* $I_S = I_R$

in short circuit :-

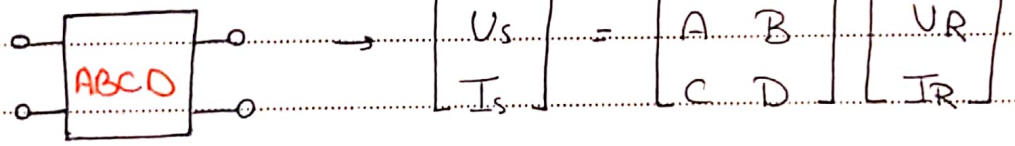
→ A = 1 , B = Z , C = 0 , D = 1

Transmission line :-

1) short < 80

2) meduim → 80 — 250

3) long > 250



$\therefore V_S = AV_R + BI_R$

$\therefore I_S = CV_R + DI_R$

* AD − BC = 1 → قاعدة عامة ⇒ تنطبق على كل الأنظمة

* at no load I_R = zero.

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* $V_R = \dfrac{V_{R}(\text{no load}) - V_{R}(\text{full load})}{V_{R}(\text{full load})} \times 100\%$ → voltage regulation.

$V_{\text{no load}} = \dfrac{V_s}{A}$ → $A \neq 1$ → short في حالة $A = 1$

↳ $V_s = V_{R\,\text{no load}}$:-

"بلقي تشابه في الإصلاح" ت

↳ * Regulation at short $= \dfrac{V_s - V_R}{V_R}$

* Regulation in general. $= \dfrac{\frac{V_s}{a} - V_R}{V_R}$

* $\eta = \dfrac{P_{3\phi R}}{P_{3\phi S}} = \dfrac{I_R \cdot V_R}{I_s \cdot V_s}$

* ملاحظة :- اذا ما في load مقاومة ما يوجد power factor.

Scanned by CamScanner

Example :-

220 kV , 40 km , $R = 0.15\ \Omega/km$, $1.3263\ mH/km$, $f = 60$

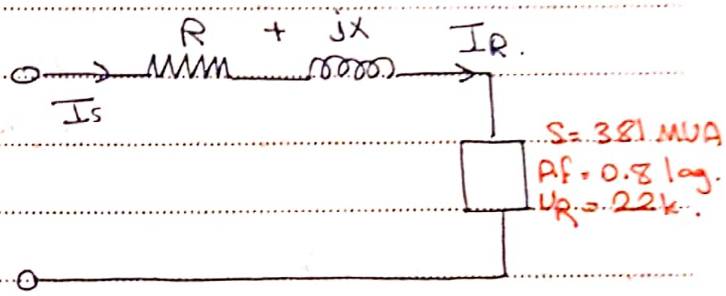
مقدار تحمل الخط.

a) 381 MVA at 0.8 pf lag at 220 kV.
b) 381 MVA at 0.8 pf leading at 220 kV.

Solution :-

$R = 0.15 * 40\ km = 6\ \Omega/km$

$X_L = (2\pi f L) \cdot L = 0.5 * 40\ km$
$= 20\ \Omega$.



$Z = (6 + j20)\ \Omega$

$V_R/phase = \frac{220}{\sqrt{3}} = 127\ kV = 127\angle 0\ kV$

$I_R = \frac{S_R^*}{3 V_R^*} \Rightarrow S_R = 381 \angle \cos^{-1} 0.8 = 381 \angle 36.87\ MVA$.

$\therefore I_R = \frac{381 \angle -36.87}{3 * 127 \angle 0} = 1000 \angle -36.87$.

$\therefore V_s/phase = V_R + (I_R * Z)$
$= 144.33 \angle 4.93\ Kvolt$

$\therefore V_s(L.L) = 144.33 \angle 4.93 * \sqrt{3} = 250\ kV$.

$\therefore V_R = \frac{250 - 220}{220} * 100\% = 13.6\ \%$.

↳ لأنه lag طلع موجب

* active power sending دايمًا أكبر من active power reciving.

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(Reciving) ← 304.8 = 381 * 0.8 ← active power دايمًا *

$3UI^*$ ← (3)(I)(144.33) = Sending power *

$\eta = \frac{P_{3\phi R}}{P_{3\phi s}} = \frac{304.8}{3\cancel{04}.8}$ → $S_{3\phi} = 3UI^*$

$= \frac{304.8}{322.75} = 94.4\%$

↳ $S_{3\phi} = 3UI^*$.

2) $Z = 6 + j20\ \Omega$.

S at leading p.f = 0.8 = $381 \angle -36.87$ MVA.

$\therefore I_R = 1000 \angle 36.87$ A

$U_{s\,phase} = U_R + I_R Z = 121.4 \angle 9.29$ kV.

$U_{s\,(L)} = 210.26$ kV.

* lead خلاني عند سالب ح

$\therefore U_R = \frac{210.26 - 220}{220} \times 100\% = \ominus 4.4\%$

$S = (3)(121.39 \angle 9.29) \cdot (1000 \angle -36.87 \times 10^3)$

$= 322.79 \ominus j168.61$ MVA. ينتج

load فاضل (↳) $322.79 \oplus j287.9$ استهلاك.