SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

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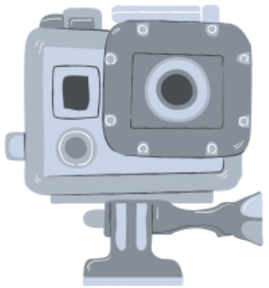
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

UNIT 4

Fault Analysis – Balanced Faults

19EET302 – Power System 1
III year / V Semester

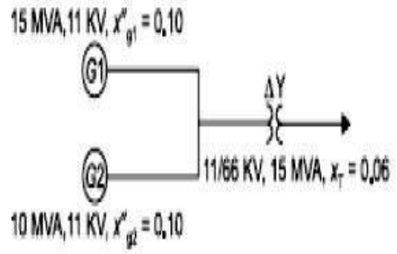


Problem formulation

Fault Analysis

Problem

- Two generators G1 and G2 are rated 15MVA, 11KV and 10MVA, 11KV respectively. The generators are connected to a transformer as shown in fig. Calculate the sub transient current in each generator when a three phase fault occurs on the high voltage side of the transformer.



Solution: Choose a base 15 MVA

$$x''_{g1} = j0.10 \text{ pu}$$

$$x''_{g2} = j0.10 \times \frac{15}{10} = j0.15 \text{ pu}$$

Solution

$$x_T = j0.06 \text{ pu}$$

$$I_f = \frac{V_o}{j0.12} = \frac{1}{j0.12} = -j8.33 \text{ pu}$$

$$I'_{g1} = \frac{j0.15}{j(0.1+0.15)} \times (-j8.33)$$

$$= -j5.0 \text{ pu}$$

$$I'_{g2} = \frac{j0.10}{j(0.1+0.15)} \times (-j8.33) = -j3.33 \text{ pu}$$

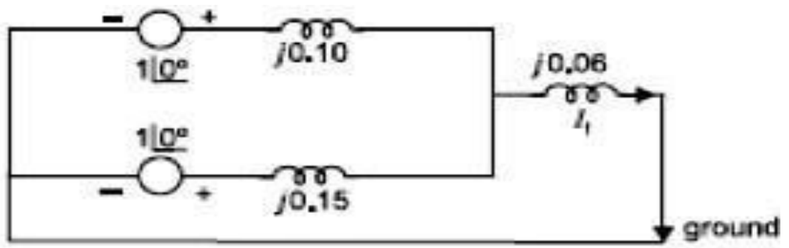


Fig. 8.7(*a*)

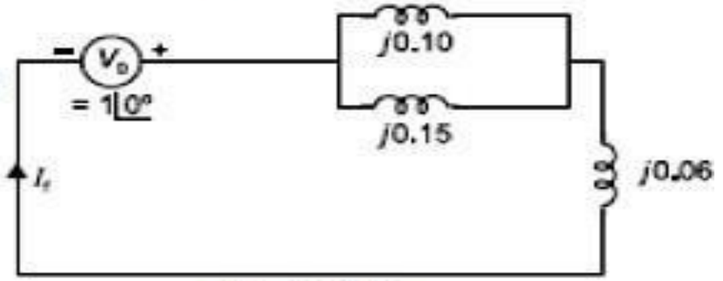


Fig. 8.7(*b*)

Base current

$$I_B = \frac{15 \times 1000}{\sqrt{3} \times 11} = 787.3 \text{ Amp.}$$

$$\therefore \quad I'_{g1} = -j5 \times 787.3 = -j3.936 \text{ KA.}$$

$$I'_{g2} = -j3.33 \times 787.3 = -j2.621 \text{ KA.}$$

$$I_f = -j8.33 \times 787.3 = -j6.557 \text{ KA.}$$

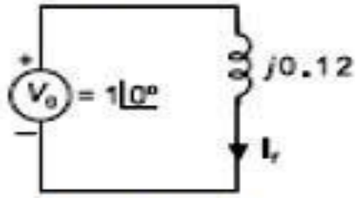
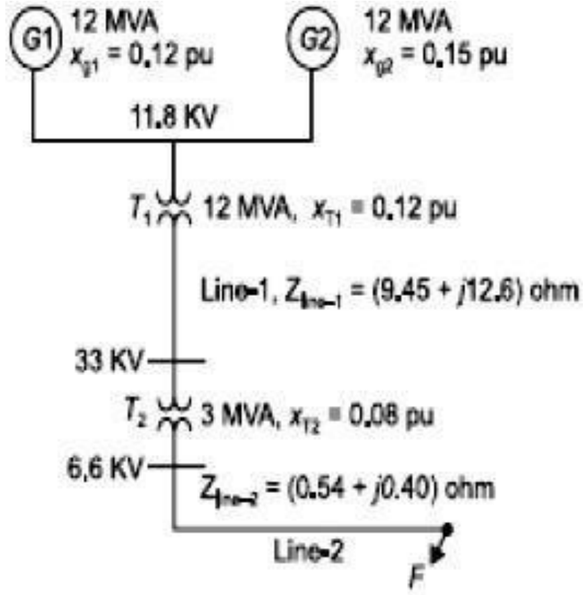


Fig. 8.7(*c*)

A Problem

A radial power system network is shown in fig. a three phase balanced fault occurs at F. Determine the fault current and the line voltage at 11.8 KV bus under fault condition.



Soln

Solution:

Let Base MVA = 12

Base Voltage = 11.8 KV.

$$x_{g1} = j0.12 \text{ pu}, \quad x_{g2} = j0.15 \text{ pu}$$

$$x_{T1} = j0.12 \text{ pu},$$

$$x_{T2} = j0.08 \times \frac{12}{3} = j0.32 \text{ pu}$$

Base voltage for line-1 is 33 KV.

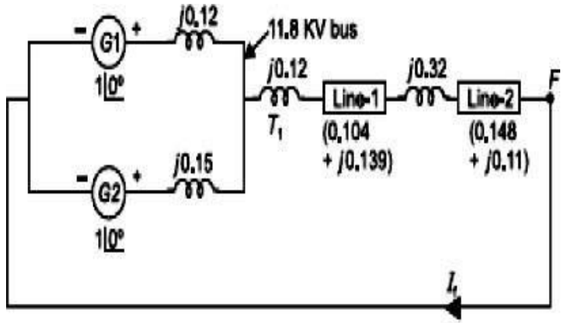
Base voltage for line-2 is 6.6 KV.

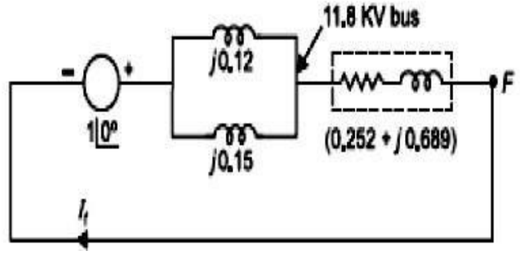
$$Z_{B,\,line\text{-}1} = \frac{(33)^2}{12} = 90.75 \text{ ohm.}$$

$$Z_{B,\,line\text{-}2} = \frac{(6.6)^2}{12} = 3.63 \text{ ohm.}$$

$$\therefore \quad Z_{line\text{-}1} = \frac{(9.45 + j12.6)}{90.75} = (0.104 + j0.139) \text{ pu}$$

$$Z_{line\text{-}2} = \frac{(0.54 + j0.40)}{3.63} = (0.148 + j0.11) \text{ pu}$$





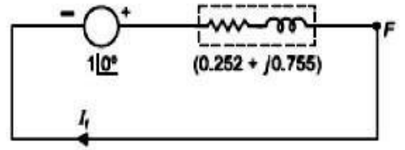


Fig. 8.12(c)

Base current $I_B = \dfrac{12 \times 1000}{\sqrt{3} \times 6.6} = 1049.7 \text{ Amp.}$

Now $I_f = \dfrac{1\angle 0^\circ}{(0.252 + j0.755)} = 1.256\angle -71.5^\circ \text{ pu}$

$\therefore \quad I_f = 1.256\angle -71.5^\circ \times 1049.7$

$\therefore \quad I_f = 1318.4\angle -71.5^\circ \text{ Amp.}$

Total impedance between F and 11.8 KV bus

$= (0.252 + j0.689) \text{ pu}$

Voltage at 11.8 KV bus

$= 1.256\angle -71.5^\circ \times (0.252 + j0.689)$

$= 0.921\angle -1.6^\circ \text{ pu}$

$= 0.921\angle -1.6^\circ \times 11.8 \text{ KV}$

$= 10.86\angle -1.6^\circ \text{ KV.}$ **Ans.**

Summary

Activity

KEEP
LEARNING..

Thank u

SEE YOU IN NEXT CLASS