Name = M-Usama

ID # = 14150

Subject = Power-system Analysis

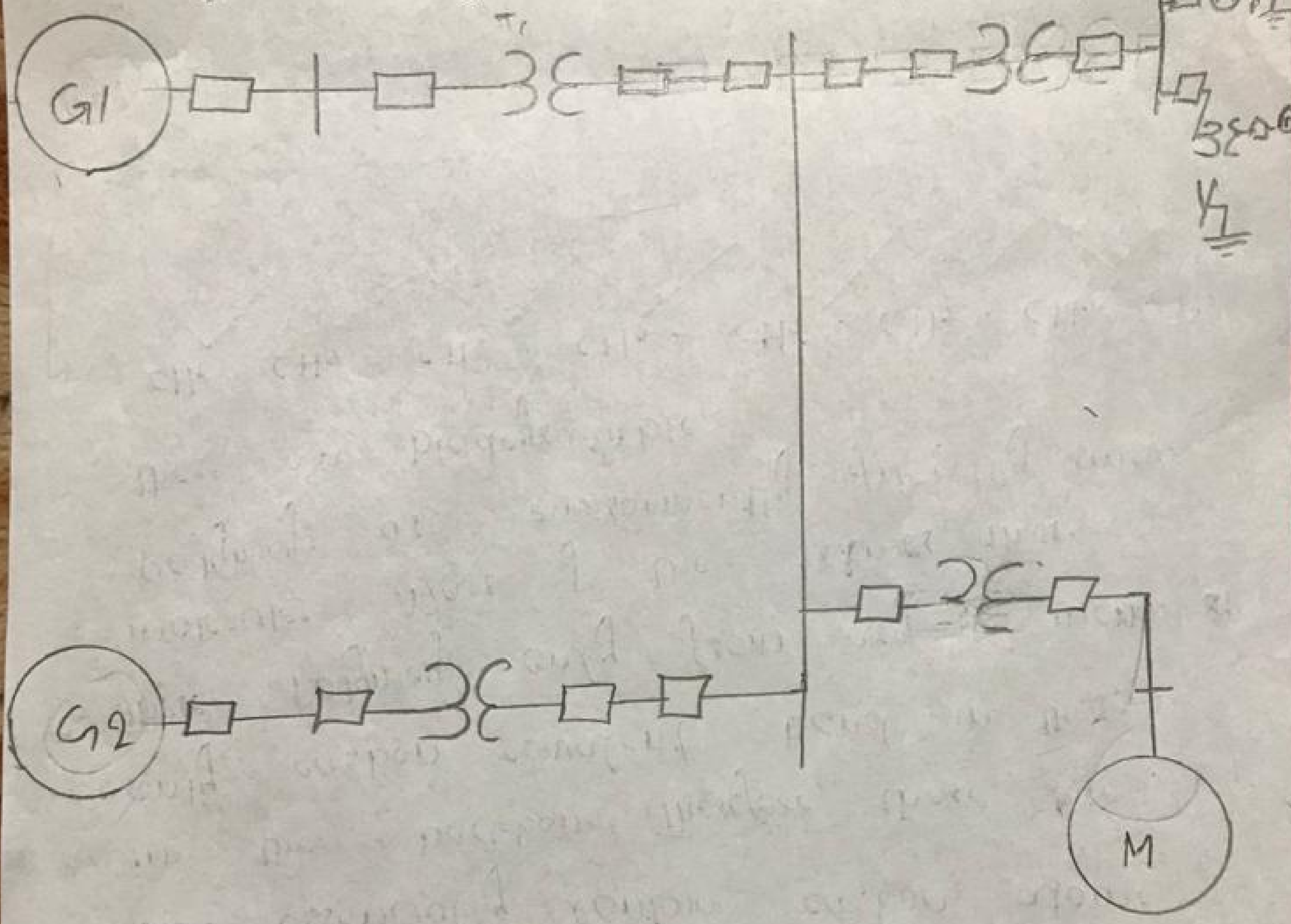
submitted to = Engr: Muhammad-Amir-Aman.

Semisster = 8Th

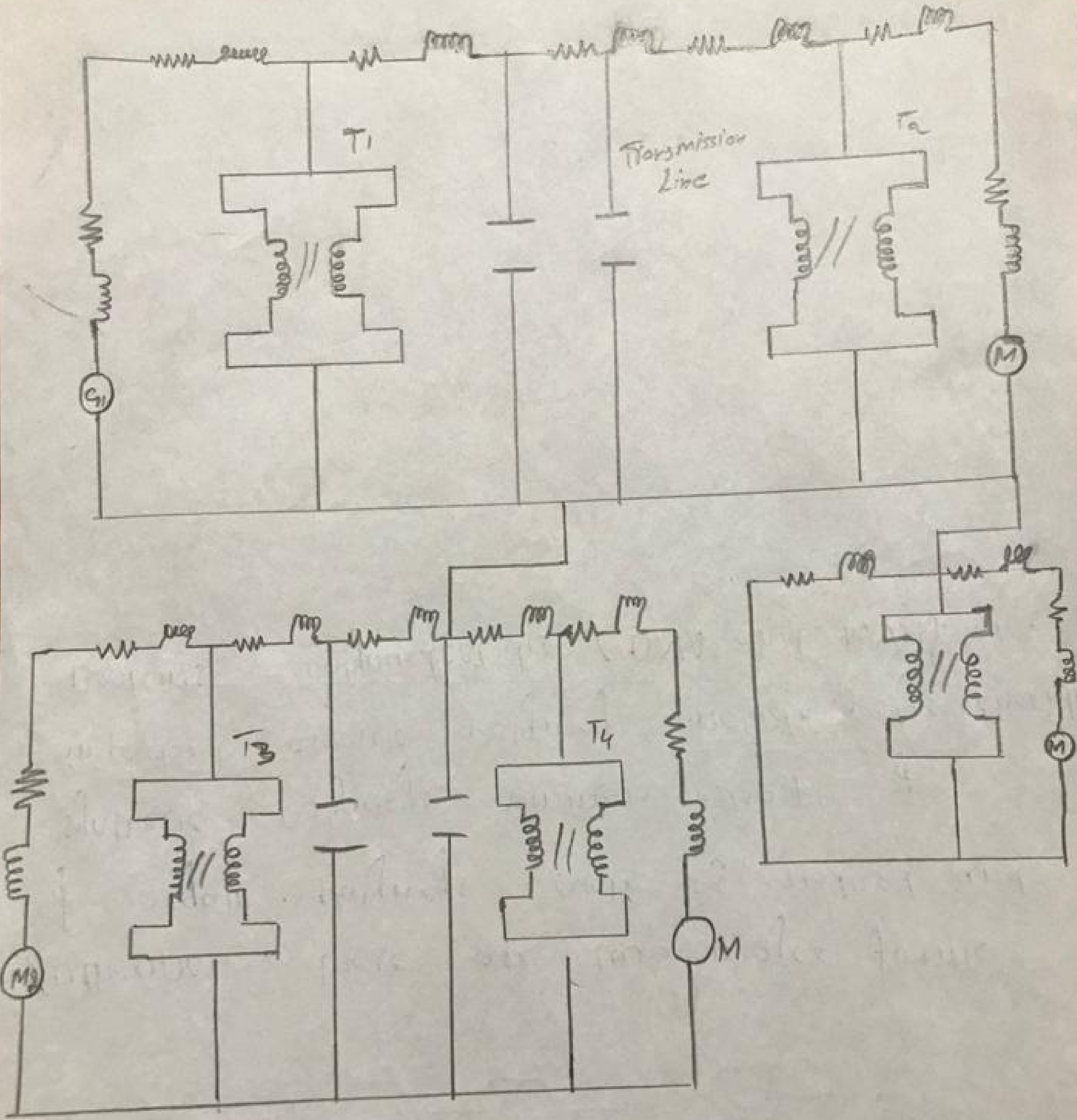
Program = B-Tech-(E)

M. Usama 1 ID # 14150

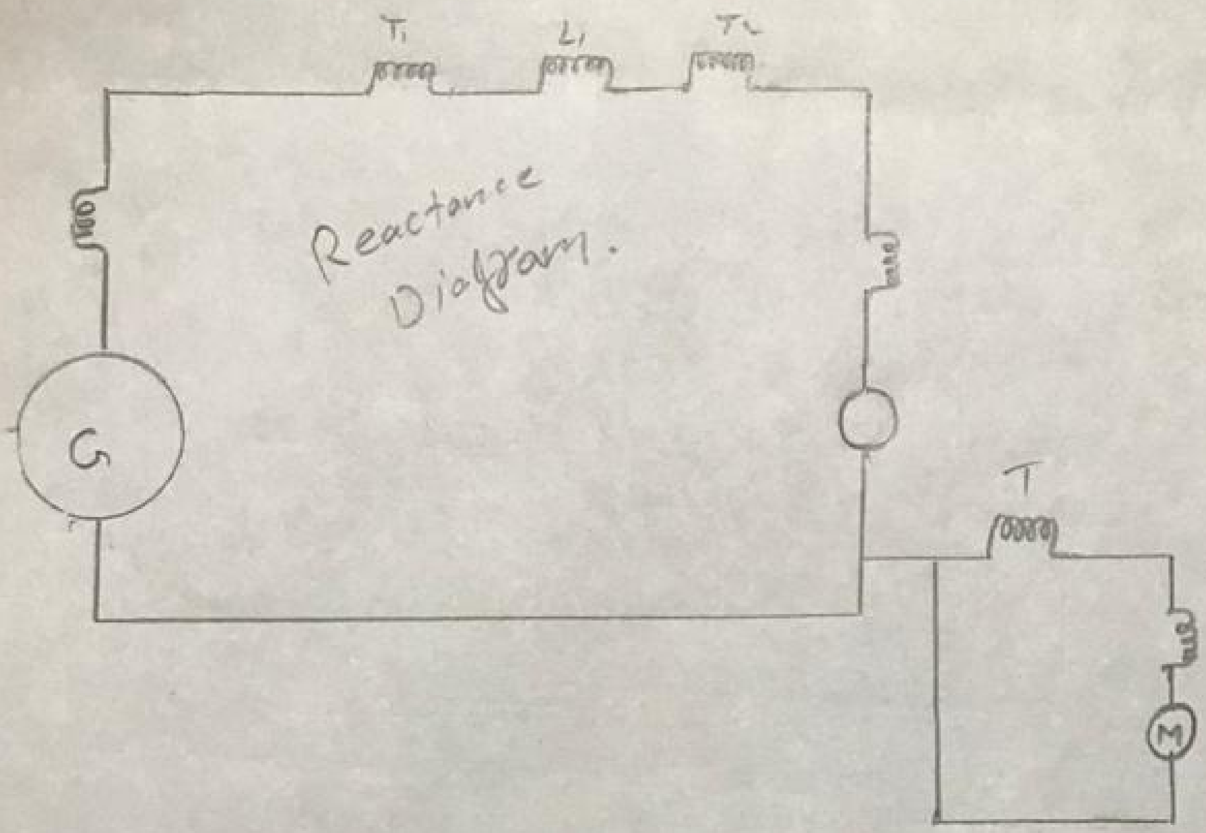
Q1 Single line Diagram Convete into Reduce Impedance

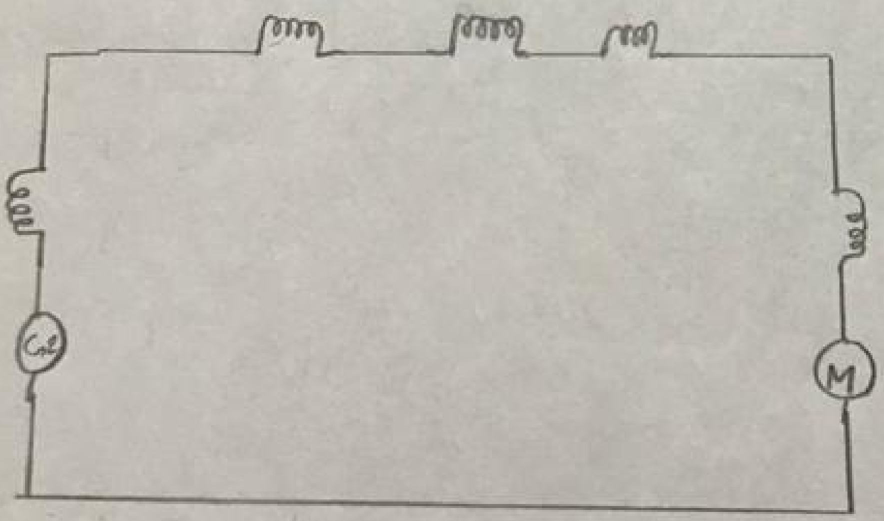


M. Usama 2 ID # 14150



M. Usama 3 ID # 14150





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Q2 A T/F is Rated 20kV/220kV 300 MVA and . . . . .

Sol:

$V_{pu} = Z_{pu} \times I_{p.u}$

$= 6.4 \times 350 = 2.240$

$S_{p.u} = V \times I$

22×350

$S = 7700$

$Z_{p.u} = \frac{V^2_{base}}{S_{base}}$

$\frac{(22)^2}{7700} = \frac{484}{7700}$

$= \boxed{0.0628}$

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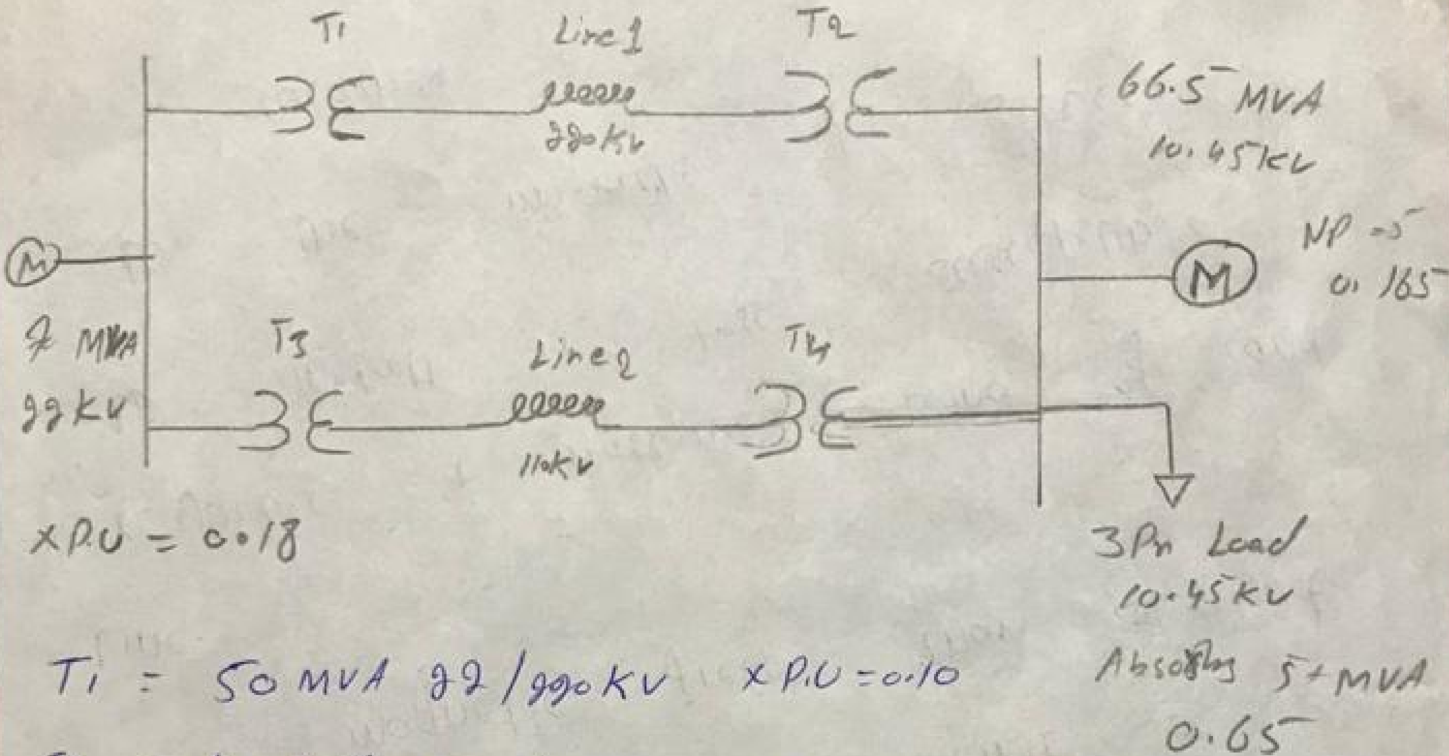


T1 = 50 MVA 22/220 kV xP.U = 0.10

T2 = 40 MVA 220/11 kV xP.U = 0.06

T3 = 40 MVA 22/11 kV xP.U = 0.064

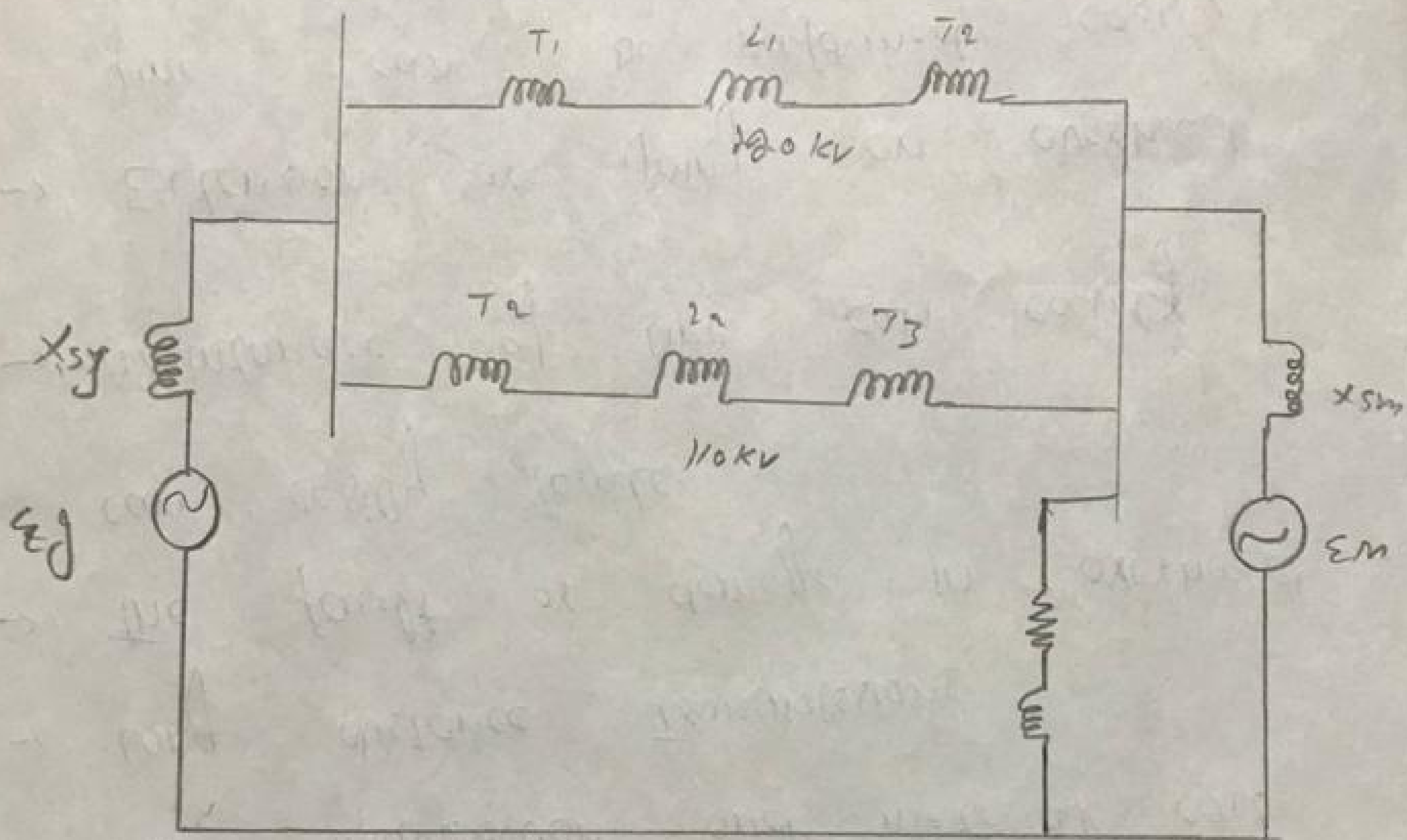
T4 = 40 MVA 110/11 kV xP.U = 0.08

Line 1 = 48.4 ohm (Total)

Line 2 = 65.43 ohm (total)

⇒ The equalient impedance daigram of The above system.

Impedance Diagram



Assume a system Sbase of 100 MVA -
This is random occupation given chosen to make a calculation Easy when Per unit impedance -

SO Sbase = 100 MVA.

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Calculation :-

$$Z_{base} = \frac{kV_{base}^2}{Z\ base\ MVA}$$

=> For T-Line 1 $Z_{base} = \frac{(220)^2}{100} = 484$ ohm

=> For T-Line 2 $Z_{base} = \frac{(110)^2}{100} = 121$ ohm

For 3-Phase Load $Z_{base} = \frac{(11)^2}{100} = 1.21$ ohm

=> $$Z_{P.U} = \frac{Z_{actual}}{Z_{base}}$$

$$Z_{P.U.new} = Z_{P.U.old} \left(\frac{S_{base\ new}}{S_{base\ old}}\right)\left(\frac{V_{base\ old}}{V_{base\ new}}\right)$$

The ratio of the T/F voltage rating on the primary side & secondary side to the system normal voltage on the same side.

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For T Line 1 using X 11 P.U = $\frac{48.4}{484}$ = 0.1 P.U

For T Line 2 using (2) X L 2 P.U = $\frac{65.43}{121}$

0.5 P.U

For 3-Phase Load

power factor $\cos^{-1}(0.6) = \angle 53.13$

Thus $S3\phi$ (Load) = $57 \angle 53.13$

Zad $\left(\frac{(V_{rated})^2}{S^2}\right) = \frac{10.45^2}{57 \angle -53.13}$

$\Rightarrow 1.1415 + j1.53267$ ohm

$$\frac{1.1495 + j1.5326}{1.21}$$

0.95 + j1.2667 PU

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For generator The new per unit reactance equation -

$$X_{sg} = 0.18\left(\frac{100}{90}\right)\left(\frac{22}{22}\right)^2$$

$$= 0.2 \text{ P.U}$$

For Transformer T_1 : $x_{t1} = 0.1\left(\frac{100}{50}\right)\left(\frac{22}{22}\right)^2 = \boxed{0.2 \text{ P.U}}$

For // T_2 : $x_{t2} = 0.06\left(\frac{100}{4}\right)\left(\frac{220}{220}\right)^2 = \boxed{0.15 \text{ P.U}}$

For // T_3 : $x_{t3} = 0.064\left(\frac{100}{40}\right)\left(\frac{220}{220}\right)^2 = \boxed{0.16 \text{ P.U}}$

For T/F T_4 : $x_{t4} = 0.08\left(\frac{100}{40}\right)\cdot\left(\frac{110}{110}\right)^2 = \boxed{0.2 \text{ P.U}}$

For Motor. $X_{sm} = 0.185\left(\frac{100}{66.5}\right)\left(\frac{10.45}{11}\right)^2$

$$\boxed{0.25 \text{ PU}}$$

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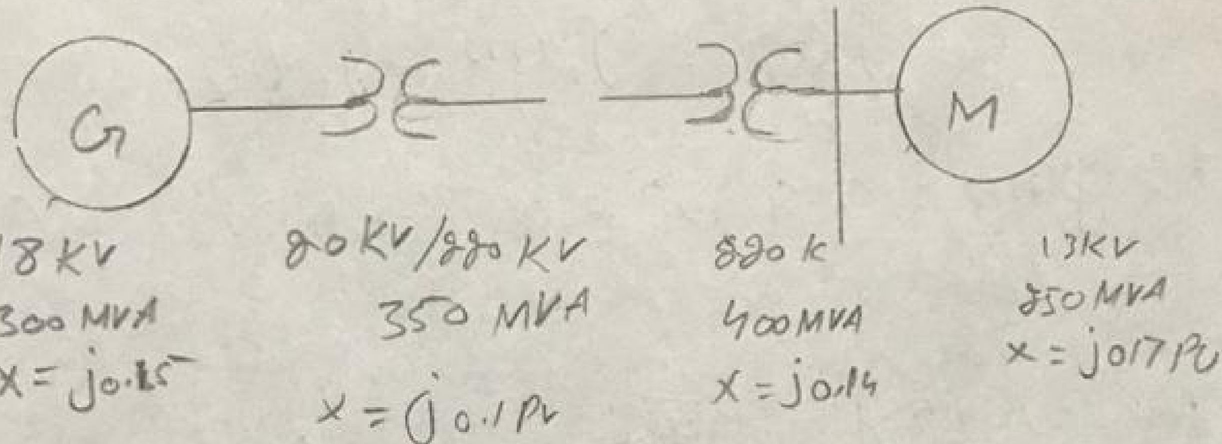

Solution:-

$$V_0 = \frac{17.8 KV}{12.66} = 0.140$$

All resistance are give in base 20 MVA and apparant voltage

Load = 200 MVA, 0.80 Power factor Leading.

$$\frac{200}{10} = 10 P.U$$

⇒ Per fault current -

$$I_0 = \frac{10}{0 Max \times 0.80} = \frac{10}{0.112} = \boxed{89.2857}$$

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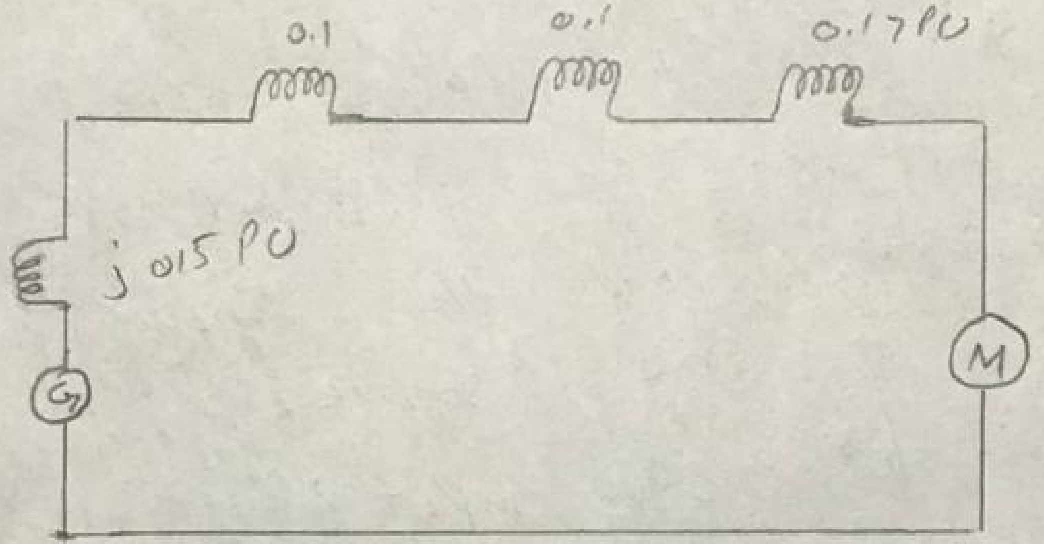
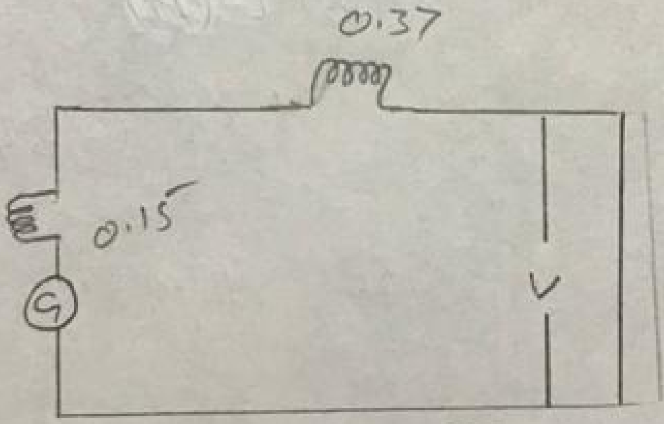
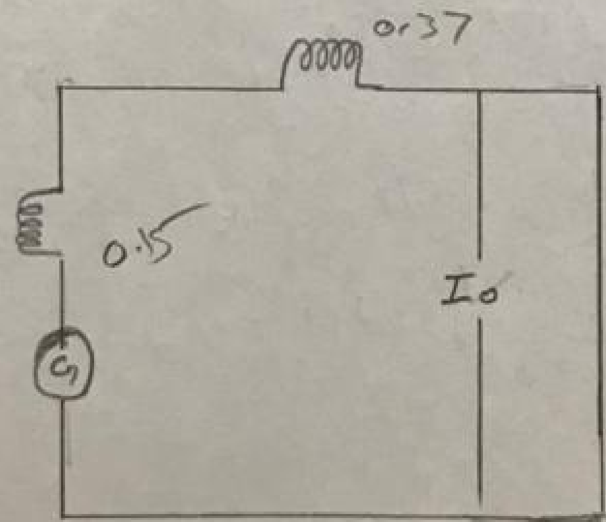
Perfault equalient ckt :-







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Q=6

Ans

over current protactive devices must operate to isolate short ckt fault safely minimize damage to circuit element avoid if possible of shut-down of plant and An accurate knowledge prosfactive fault current through out The system is essentional for The correct application of protactive device and Thermal arrangement to Withstand Consequential mechanical and Thermal stresses.