ASSIGNMENT 1

(Refer 'Power System Analysis & Design' - B.R Gupta).

① Fig shows a power system. The ratings of generators & transformers are;

G_{11} = 25 MVA, 6.6 kV, j0.2 pu.

G_{12} = 15 MVA, 6.6 kV, j0.15 pu.

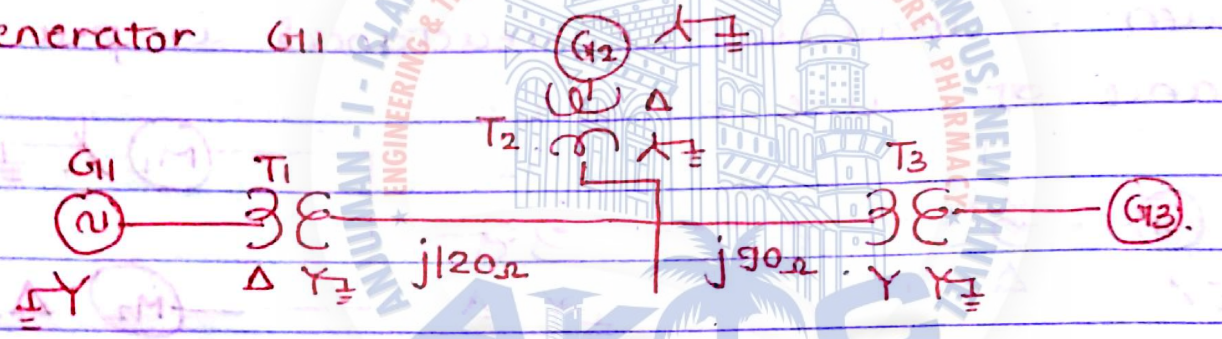
G_{13} = 30 MVA, 13.2 kV, j0.15 pu.

T_1 = 80 MVA, 6.6 Δ — 115 Y kV, j0.1 pu.

T_2 = 15 MVA, 6.6 Δ — 115 Y kV, j0.1 pu.

T_3 = 1φ units each rated 10 MVA, 69/6.9 kV, j0.1 pu.

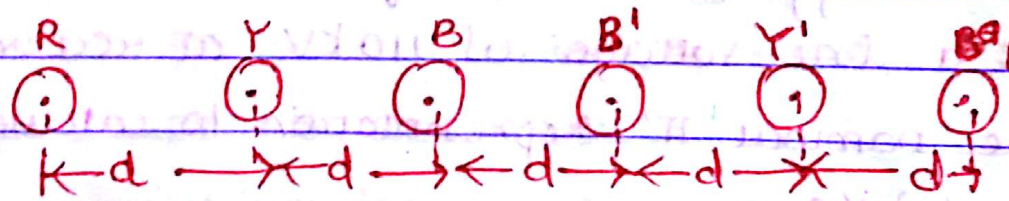
Draw impedence diagram with all values in pu on a base of 30 MVA, 6.6 kV in the circuit of generator G_{11}



② A symmetrical 3φ double circuit line is arranged in horizontal plane as shown. Assume balanced loads equally distributed in two circuits. The radius of each conductor is 'r'

(a) Derive expression for inductance

(b) Find 'L'/km if $r = 0.9 \times 10^{-2}$ and d = 3.5 m.



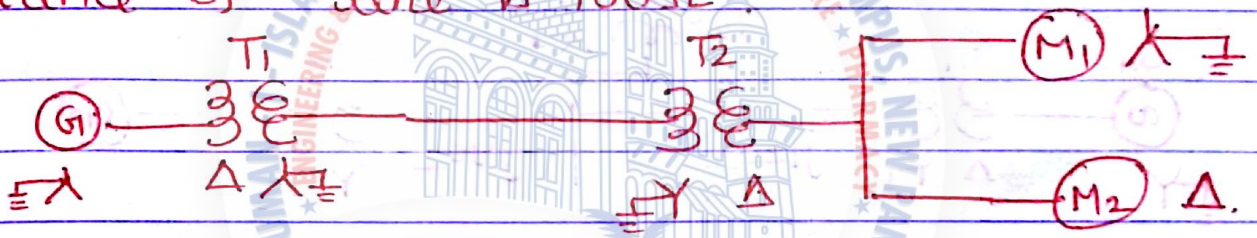
(3) A 90 MVA, 11 kV, 3ϕ generator has a reactance of 25%. The generator supplies 2 motors through transformers & transmission line as shown. The transformer T_1 is a 3ϕ transformer, 100 MVA, 10/132 kV, 6% reactance.

The transformer T_2 is composed of 3 1ϕ units each rated at 30 MVA, ~~10/132~~ 66/10 kV, 5% reactance.

Motors are rated at 50 MVA & 40 MVA both 10 kV & 20% reactance.

Taking generator ratings as base, draw reactance diagram & indicate the reactances in p.u.

Reactance of line is 100 Ω.



(4) A 3ϕ, 50 Hz, 100 km long overhead line has following constants

R/ph/km = 0.153 Ω

L/ph/km = 1.21 mH.

C/ph/km = 0.00958 μF

The line supplies a load of 25 MVA at 0.8 p.f (lag) at a line voltage of 110 kV at receiving end. Use nominal 'π' representation to calculate

(i) V_s

(ii) I_s

(iii) $\cos\phi_s$.

Assignment No 2:

(1) Derive the equivalent 'T' & 'π' network of a long transmission line.

(2) A suspension string insulator has 3 units. Each unit can withstand a maximum voltage of 11kV. The capacitance of each joint & metal work is 10.5% of the capacitance of each disc.
Find (i) Voltage distribution along string
(ii) Max line voltage for which the string can be used
(iii) String efficiency.

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