EE 466 Term 062

Assignment 1

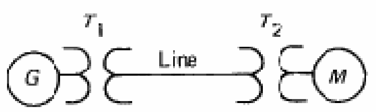
Due Date Monday March 12, 2007

Q1. Draw the impedance diagram of the following network in per unit with respect a 100 MVA bas and a voltage of 13.8 kV on the generator side. The network data is shown in Table 1 below.

Table 1

Equipment	Power (MVA)	Voltage (kV)	Reactance (%)
G	100	13.8	4
T1	80	13.8/230	7
T2	80	13.8/230	7
M	75	13.8	4

The transmission line has an impedance Z = j 100 Ohms.



Q2. (a) A Y-connected voltage source has the following unbalanced voltages:

$$V_a = 177\angle 10^0\ ;\ V_b = 156\angle -100^0\ ;\ V_c = 105\angle 220^0$$

Obtain the symmetrical components of voltages.

(b) The symmetrical components of a phase current are given below in per unit

$I_a^{(1)} = -0.8-j2.6$ per unit
$I_a^{(2)} = -j2.0$ per unit
$I_a^{(0)} = -j3.0$ per unit

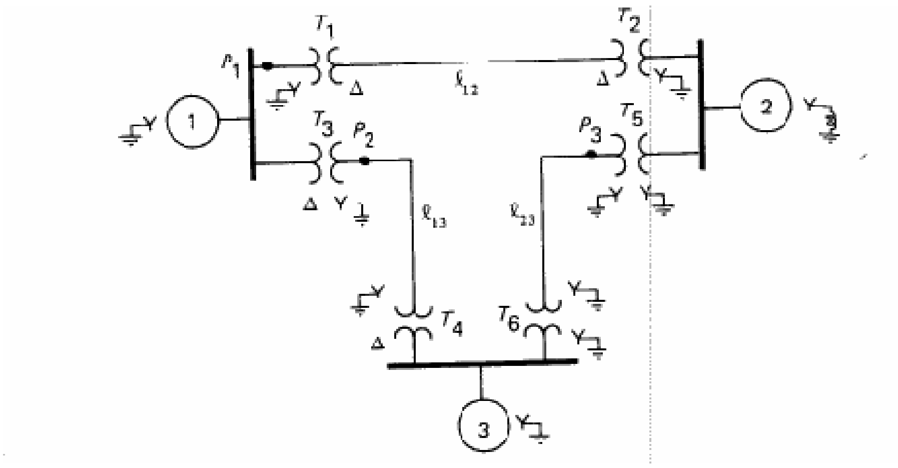
Obtain the phase current I_a , I_b , I_c .

Q3. (a) Draw the zero sequence impedance diagram of the following network. The zero sequence impedance of each component is given in per cent to the same base.

Table 1

Equipment	Reactance (per unit)
G_1-G_3	0.1
T_1-T_6	0.05
X_n	0.05
X_{l12}	0.80
X_{l13}	0.40
X_{l23}	0.55

(b) Obtain the Thevenin equivalent zero sequence impedance for faults at points P1, P2 and P3.



Q4 Two generators are connected through two transformers to a high voltage bus which supplies a line. The line is open –circuited at the remote. The pre-fault voltage at the end of the line is 515 KV. The system is shown below and the system data is given in the following a table.

Table 2 System data

Equipment	Rated power (MVA)	Rated voltage (KV)	X_1 Per unit	X_2 Per unit	X_0 Per unit
G_1	1000	20	0.1	0.1	0.05
G_2	800	22	0.15	0.15	0.08
T_1	1000	500Y/20Δ	0.175	0.175	0.175
T_2	800	500Y/22Y	0.16	0.16	0.16
Transmission Line	1500	500	0.15	0.15	0.40

Work on a base power of 1000 MVA and base voltage 500 kV on the transmission line.
The neutral of Generator G_1 is grounded through a reactance of 0.04 Ohms.

Find the value of the fault current in amperes for the faults at the end of line for the following cases:

(i) Single-line-ground
(ii) Line-line
(iii) Line-line-ground