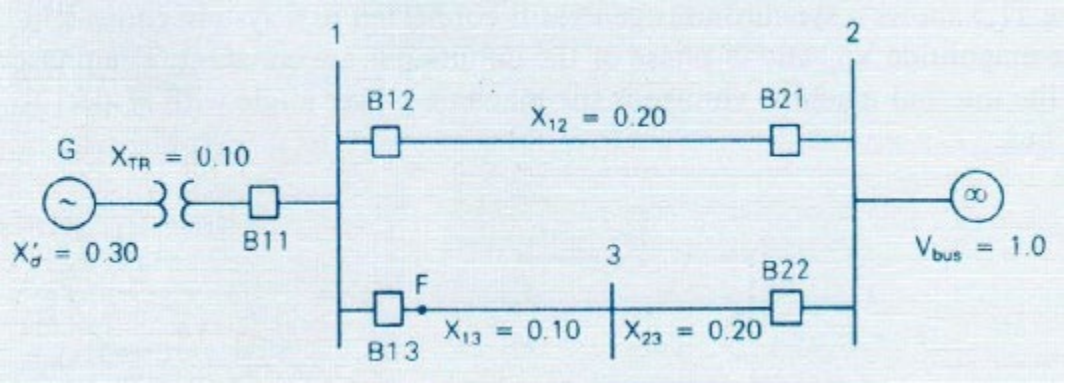
Bonus Test:

<< Bonus marks are given only if the detailed proper calculations are provided >>

Question 1:



The 60-Hz generator G is delivering a real power of 0.95pu at a lagging power factor of 0.88 to the infinite bus.

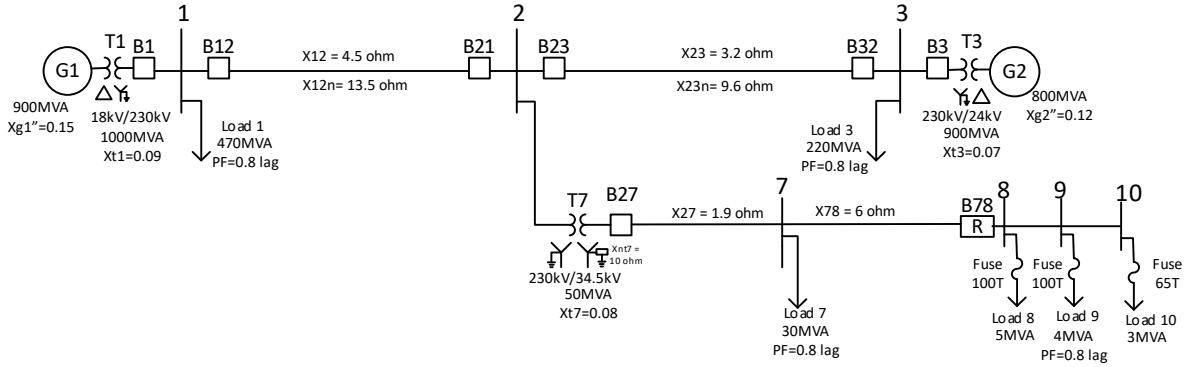
(a) Assume that a fault occurs at bus 3. Breakers B13 and B22 clear the fault when the rotor angle (power angle) increases by $\Delta\delta = +40^o$ during the fault.

Show, with calculations, if the generator can/cannot return to a stable operation after the fault is cleared.
{Hint: by comparing accelerating area A_1 and decelerating area A_2 when A_2 becomes maximum possible within stability}

(b) Assume that breaker B22 inadvertently opens.

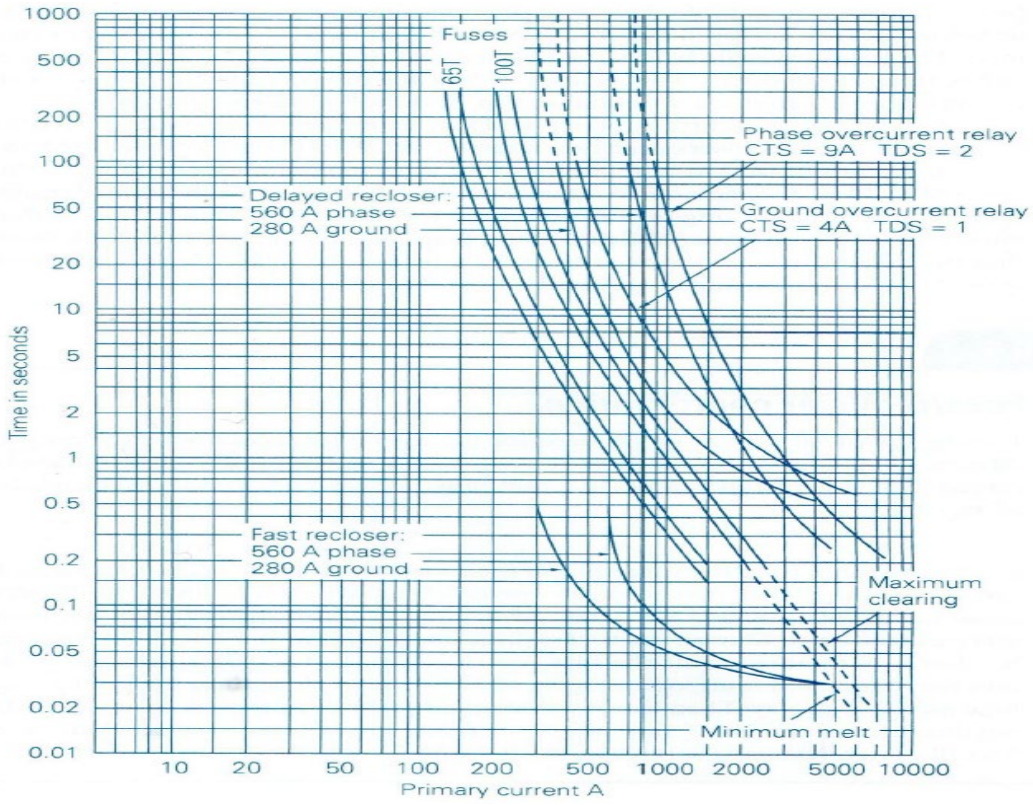
Show, with calculations, if the generator can/cannot return to a stable operation after breaker B22 opens.

Question 2:



Calculate all relay settings for the breaker B27 and recloser B78 for protections of "single-line-to-ground" faults.

Voltage Ratios						
1:1	2:1	2.5:1	4:1	5:1	20:1	40:1
60:1	100:1	200:1	300:1	400:1	600:1	800:1
1000:1	2000:1	3000:1	4500:1			
Current Ratios						
50:5	100:5	150:5	200:5	250:5	300:5	400:5
450:5	500:5	600:5	800:5	900:5	1000:5	1200:5
1500:5	1600:5	2000:5	2400:5	2500:5	3000:5	3200:5
4000:5	5000:5	6000:5				


Time in seconds
1000
500
200
100
50
20
10
5
2
1
0.5
0.2
0.1
0.05
0.02
0.01
10
20
50
100
200
500
1000
2000
5000
10000
Primary current A
Fuses
65T
100T
Phase overcurrent relay
CTS = 9A TDS = 2
Ground overcurrent relay
CTS = 4A TDS = 1
Delayed recloser:
560 A phase
280 A ground
Fast recloser:
560 A phase
280 A ground
Maximum
clearing
Minimum melt