

Name: Yazan Yousaf

Q2:

ID: 1170249

① Max nominal current:

$$I_{L1} = \frac{1MW}{\sqrt{3} (33 k) 0.99} = 17.67 A$$

$$I_{L2} = 17.67 A, I_{L3} = 17.67 A, I_{L4} = 17.67 A$$

② between busses 8

$$I_{45} = I_{L4} = 17.67 A$$

$$I_{34} = I_{45} + I_{L3} = (2)(17.67) = 35.34 A$$

$$I_{23} = I_{34} + I_{L2} = (3)(17.67) = 53.01 A$$

$$I_{12} = I_{CB} = I_{23} + I_{L1} = (4)(17.67) = 70.68 A$$

CB	70.68 A
Fuse 1	53.01 A
Fuse 2	17.67 A
" 3	35.34 A
" 4	17.67 A
" 5	17.67 A
" 6	17.67 A
" 7	17.67 A

①

② Fuse Ratings:

i) Fuse (7) \rightarrow Normal: 17.67A \rightarrow From Table: $\boxed{12T}$

ii) Fuse (5) coordinated with Fuse (7):

Normal \Rightarrow 17.67A From Table (2): The least type that can be coordinated with

~~Fault \Rightarrow~~ $\boxed{12T}$ \Rightarrow 20T, AFD, FI = 5

From Table (1):

Normal (20T) = 30A $>$ Normal (Fuse (5)) = 17.67A \checkmark

Fault (20T with 12T) = 680 $>$ 644 Fault at Fuse 7 \checkmark

So $\boxed{\text{Fuse 5} = 20T}$

iii) Fuse 6 \Rightarrow Normal only \rightarrow From Table (1) \Rightarrow $\boxed{12T}$

iv) Fuse 4 \Rightarrow $F = (FD, FI) \rightarrow$ $\leq + \leq (1) = \boxed{12T}$

v) Fuse 2 \Rightarrow $\leq \rightarrow \leq (1) = \boxed{12T}$

vi) Fuse 3 \Rightarrow Coordinate with Fuse (5) & Fuse (6)

Since type of Fuse (5) is 20T & Fuse (6) is 12T

Fuse (3) will be coordinated with Fuse (5) so it

includes Fuse (6) coordination \Rightarrow

(2)

* Fuse (3) with Fuse (5) \Rightarrow

From Table 2, the last number of Fuse (5) ^(20T) to be coordinated with is 30T with fault = 990

check 30T for Fuse (3) when coordinated with Fuse (5):

① Normal $\Rightarrow 45 A >$ Normal Fuse (3) = 35.34 A ✓

② Fault of coordinating 20T with 30T = 990 A & the fault at Fuse (5) is (0.823 kA) = 823 A ✓

it passes the test:

\rightarrow Fuse (3) = 30T

vii) Fuse (1) coordination:

① From Table 2, the last number of Fuse (3) (30T) to be coordinated with is (50T) with fault = 1500 A.

check 50T for Fuse (1) when coordinated with Fuse (3)

① Normal (50T) = 75 A $>$ Normal Fuse (1) = 53.01 A ✓

② Fault of coordinating 30T with 50T = 1500 A & the fault of Fuse (3) = 1053 A ✓

it passes the two tests, Fuse (1) = 50T.

③

Summarizing:

CB	70.68 A	Co 9
Fuse 1	3.01 A	60T
2	17.67 A	12T
3	35.34 A	30T
4	17.67 A	12T
5	17.67 A	20T
6	17.67 A	12T
7	17.67 A	12T

c) P_b

$$I_{CB} = I_s$$

$$I_{Fuse(1)} = I_s$$

$$I_{Fuse(3)} = I_s$$

$$I_{Fault} = I_s + I_{DG}$$

P

$$I_{CB} = I_s$$

$$I_{Fault} = I_s + I_{DG}$$

$$I_{Fuse(3)} = I_{DG}$$

$$I_{Fuse(1)} = I_{DG}$$

P_4

$$I_{CB} = I_s$$

$$I_{Fuse(1)} = I_s$$

$$I_{Fuse(3)} = I_s$$

$$I_{Fuse(5)} = I_s + I_{DG}$$

$$I_{Fuse(7)} = I_s + I_{DG}$$

$$I_{Fault} = I_s + I_{DG}$$

d) before the DG is connected there is no coordination between Fuse (1) and Fuse (2). However, connecting the DG will let a fault pass at (P1) to have a value of $(I_s + I_{DG})$ when I_s passing through the CB & I_{DG} passing through Fuse (1) and all the fault passing through Fuse (2).

So, When coordinating Fuse (1) & Fuse (2), Fuse (2) must melt faster than Fuse (1) in order to select the fault at (P1) only.

$$P.D = I_s + I_{DG} + I_{CB} = I_{CB}$$

$$I_{CB} = \frac{I_s + I_{DG}}{I_{CB}}$$

$$I_{CB} = \frac{I_s + I_{DG}}{I_{CB}}$$