

LAMPIRAN

Lampiran A. Surat Balasan Tempat Penelitian.



UID JAWA TIMUR
UP3 SURABAYA UTARA

Nomor : 1491/STH.01.04/F04160000/2022
Lampiran : 2 Lembar
Sifat : Segera
Hal : Ijin Penelitian Tugas Akhir

01 Desember 2022

Kepada

Yth. Yth. Dekan Fakultas Teknik
Universitas 17 Agustus 1945
Surabaya
Jl. Semolowaru No. 45
Surabaya

Menunjuk surat Saudara No. 1915/K/FT/Akd/XI/2022 tanggal 10 November 2022 dan 1885/K/FT/Akd/XI/2022 tanggal 2 November 2022 perihal Penelitian Tugas Akhir, dengan ini diberitahukan bahwa kami memberikan ijin pelaksanaan Penelitian Tugas Akhir kepada mahasiswa tersebut di bawah ini :

No.	NAMA	N I M	No. HP
1.	M. Fauzi Thohir	1451900095	083164001721
2.	Aji Riyanto	1451900082	081222319102
3.	Bagas Hernanda J	1451900092	-

Untuk pelaksanaan Penelitian di PT PLN (Persero) Unit Pelaksana Pelayanan Pelanggan Surabaya Utara ULP Kenjeran dengan catatan bahan yang diperoleh Bukan merupakan rahasia perusahaan.

Pelaksanaan Penelitian tersebut dapat dilakukan pada 02 Januari 2023 s/d 28 Februari 2023, untuk itu mahasiswa dimohon menghubungi Manager ULP Kenjeran bapak Yossy Irawan.

Demikian disampaikan atas perhatian dan kerjasamanya diucapkan terima kasih.

MANAGER UNIT PELAKSANA
PELAYANAN PELANGGAN SURABAYA
UTARA,



Tembusan:

- MUL ULP KENJERAN ULP KENJERAN PLN

Lampiran C.1. Tabel Hasil Perhitungan Arus Gangguan Hubung Singkat 3 Fasa

Penyulang	% Panjang	Arus Gangguan Hubung Singkat 3 Fasa
Tuwowo	0	$\frac{20000}{(0 + j1,0696)} = \frac{20000}{\sqrt{0^2+1,0696^2}} = 18698,579 \text{ A}$
	25	$\frac{20000}{0,5906 + j1,9174} = \frac{20000}{\sqrt{0,5906^2+1,9174^2}} = 9968,61 \text{ A}$
	50	$\frac{20000}{1,1812 + j2,7653} = \frac{20000}{\sqrt{1,1812^2+2,7653^2}} = 6651,12 \text{ A}$
	75	$\frac{20000}{1,7718 + j3,6132} = \frac{20000}{\sqrt{1,7718^2+3,6132^2}} = 4969,88 \text{ A}$
	100	$\frac{20000}{2,3625 + j4,4611} = \frac{20000}{\sqrt{2,3625^2+4,4611^2}} = 3961,925 \text{ A}$
Wiratno	0	$\frac{20000}{(0 + j1,0696)} = \frac{20000}{\sqrt{0^2+1,0696^2}} = 18698,579 \text{ A}$
	25	$\frac{20000}{0,6468 + j1,9982} = \frac{20000}{\sqrt{0,6468^2+1,9982^2}} = 9522,56 \text{ A}$
	50	$\frac{20000}{1,2937 + j2,9268} = \frac{20000}{\sqrt{1,2937^2+2,9268^2}} = 6250,05 \text{ A}$
	75	$\frac{20000}{1,9406 + j3,8554} = \frac{20000}{\sqrt{1,9406^2+3,8554^2}} = 4633,65 \text{ A}$
	100	$\frac{20000}{2,5875 + j4,7841} = \frac{20000}{\sqrt{2,5875^2+4,7841^2}} = 3677,14 \text{ A}$
Sidoyoso	0	$\frac{20000}{(0 + j1,0696)} = \frac{20000}{\sqrt{0^2+1,0696^2}} = 18698,579 \text{ A}$
	25	$\frac{20000}{0,6249 + j1,8545} = \frac{20000}{\sqrt{0,6249^2+1,8545^2}} = 10219,96 \text{ A}$
	50	$\frac{20000}{1,2499 + j2,6394} = \frac{20000}{\sqrt{1,2499^2+2,6394^2}} = 6848,4 \text{ A}$
	75	$\frac{20000}{1,8748 + j3,4243} = \frac{20000}{\sqrt{1,8748^2+3,4243^2}} = 5123,03 \text{ A}$
	100	$\frac{20000}{2,4998 + j4,2092} = \frac{20000}{\sqrt{2,4998^2+4,2092^2}} = 4085,35 \text{ A}$
Rangkah	0	$\frac{20000}{(0 + j1,0696)} = \frac{20000}{\sqrt{0^2+1,0696^2}} = 18698,579 \text{ A}$
	25	$\frac{20000}{0,6317 + j1,863} = \frac{20000}{\sqrt{0,6317^2+1,863^2}} = 10166,81 \text{ A}$
	50	$\frac{20000}{1,2634 + j2,6564} = \frac{20000}{\sqrt{1,2634^2+2,6564^2}} = 6799,16 \text{ A}$
	75	$\frac{20000}{1,8951 + j3,4497} = \frac{20000}{\sqrt{1,8951^2+3,4497^2}} = 5081,35 \text{ A}$
	100	$\frac{20000}{2,5268 + j4,3431} = \frac{20000}{\sqrt{2,5268^2+4,3431^2}} = 3980,36 \text{ A}$

Lampiran C.2. Tabel Hasil Perhitungan Arus Gangguan Hubung Singkat 2 Fasa

Penyulang	% Panjang	Arus Gangguan Hubung Singkat 2 Fasa
Tuwowo	0	$\frac{34641,01615}{2 \times (0 + j1,0696)} = \frac{34641,01615}{\sqrt{0^2+2,1392^2}} = 16193,45 \text{ A}$
	25	$\frac{34641,01615}{2 \times (0,5906 + j1,9174)} = \frac{34641,01615}{\sqrt{1,1812^2+3,8348^2}} = 8633,07 \text{ A}$
	50	$\frac{34641,01615}{2 \times (1,1812 + j2,7653)} = \frac{34641,01615}{\sqrt{2,3624^2+5,5306^2}} = 5760,04 \text{ A}$
	75	$\frac{34641,01615}{2 \times (1,7718 + j3,6132)} = \frac{34641,01615}{\sqrt{3,5436^2+7,2264^2}} = 4304,04 \text{ A}$
	100	$\frac{34641,01615}{2 \times (2,3625 + j4,4611)} = \frac{34641,01615}{\sqrt{4,725^2+8,9222^2}} = 3431,127 \text{ A}$
Wiratno	0	$\frac{34641,01615}{2 \times (0 + j1,0696)} = \frac{34641,01615}{\sqrt{0^2+2,1392^2}} = 16193,45 \text{ A}$
	25	$\frac{34641,01615}{2 \times (0,6468 + j1,9982)} = \frac{34641,01615}{\sqrt{1,2936^2+3,9964^2}} = 8246,78 \text{ A}$
	50	$\frac{34641,01615}{2 \times (1,2937 + j2,9268)} = \frac{34641,01615}{\sqrt{2,5874^2+5,8536^2}} = 5412,71 \text{ A}$
	75	$\frac{34641,01615}{2 \times (1,9406 + j3,8554)} = \frac{34641,01615}{\sqrt{3,8812^2+7,7108^2}} = 4012,85 \text{ A}$
	100	$\frac{34641,01615}{2 \times (2,5875 + j4,7841)} = \frac{34641,01615}{\sqrt{5,175^2+9,5682^2}} = 3184,5 \text{ A}$
Sidoyoso	0	$\frac{34641,01615}{2 \times (0 + j1,0696)} = \frac{34641,01615}{\sqrt{0^2+2,1392^2}} = 16193,45 \text{ A}$
	25	$\frac{34641,01615}{2 \times (0,6249 + j1,8545)} = \frac{34641,01615}{\sqrt{1,2498^2+3,709^2}} = 8850,75 \text{ A}$
	50	$\frac{34641,01615}{2 \times (1,2499 + j2,6394)} = \frac{34641,01615}{\sqrt{2,4998^2+5,2788^2}} = 5930,88 \text{ A}$
	75	$\frac{34641,01615}{2 \times (1,8748 + j3,4243)} = \frac{34641,01615}{\sqrt{3,7496^2+6,8486^2}} = 4436,68 \text{ A}$
	100	$\frac{34641,01615}{2 \times (2,4998 + j4,2092)} = \frac{34641,01615}{\sqrt{4,9996^2+8,4184^2}} = 3538,01 \text{ A}$
Rangkah	0	$\frac{34641,01615}{2 \times (0 + j1,0696)} = \frac{34641,01615}{\sqrt{0^2+2,1392^2}} = 16193,45 \text{ A}$
	25	$\frac{34641,01615}{2 \times (0,6317 + j1,863)} = \frac{34641,01615}{\sqrt{1,2634^2+3,726^2}} = 8804,72 \text{ A}$
	50	$\frac{34641,01615}{2 \times (1,2634 + j2,6564)} = \frac{34641,01615}{\sqrt{2,5268^2+5,3128^2}} = 5888,25 \text{ A}$
	75	$\frac{34641,01615}{2 \times (1,8951 + j3,4497)} = \frac{34641,01615}{\sqrt{3,7902^2+6,8994^2}} = 4400,57 \text{ A}$
	100	$\frac{34641,01615}{2 \times (2,5268 + j4,3431)} = \frac{34641,01615}{\sqrt{5,0536^2+8,6862^2}} = 3447,09 \text{ A}$

Lampiran C.3. Tabel Hasil Perhitungan Arus Gangguan Hubung Singkat 1 Fasa Ke Tanah

Penyulang	% Panjang	Arus Gangguan Hubung Singkat 1 Fasa ke Tanah
Tuwowo	0	$\frac{34641,01615}{2 \times (0 + j1,0696) + (1500 + j9,8)}$ $= \frac{34641,01615}{\sqrt{1500^2 + 11,9392^2}} = 23,09 \text{ A}$
	25	$\frac{34641,01615}{2 \times (0,5906 + j1,9174) + (1500,9033 + j14,0473)}$ $= \frac{34641,01615}{\sqrt{1502,0845^2 + 17,8821^2}} = 23,05 \text{ A}$
	50	$\frac{34641,01615}{2 \times (1,1812 + j2,7653) + (1501,8065 + j18,2945)}$ $= \frac{34641,01615}{\sqrt{1504,1689^2 + 23,8251^2}} = 23,02 \text{ A}$
	75	$\frac{34641,01615}{2 \times (1,7718 + j3,6132) + (1502,7078 + j22,5418)}$ $= \frac{34641,01615}{\sqrt{1506,2534^2 + 29,7682^2}} = 22,98 \text{ A}$
	100	$\frac{34641,01615}{2 \times (2,3625 + j4,4611) + (1503,6131 + j26,789)}$ $= \frac{34641,01615}{\sqrt{1508,3381^2 + 35,7112^2}} = 22,95 \text{ A}$
Wiratno	0	$\frac{34641,01615}{2 \times (0 + j1,0696) + (1500 + j9,8)}$ $= \frac{34641,01615}{\sqrt{1500^2 + 11,9392^2}} = 23,09 \text{ A}$
	25	$\frac{34641,01615}{2 \times (0,6468 + j1,9982) + (1500,9893 + j14,4518)}$ $= \frac{34641,01615}{\sqrt{1502,2829^2 + 18,4482^2}} = 23,05 \text{ A}$
	50	$\frac{34641,01615}{2 \times (1,2937 + j2,9268) + (1501,9786 + j19,1035)}$ $= \frac{34641,01615}{\sqrt{1504,566^2 + 24,9571^2}} = 23,02 \text{ A}$
	75	$\frac{34641,01615}{2 \times (1,9406 + j3,8554) + (1502,9679 + j23,7553)}$ $= \frac{34641,01615}{\sqrt{1506,8491^2 + 31,4661^2}} = 22,98 \text{ A}$
	100	$\frac{34641,01615}{2 \times (2,5875 + j4,7841) + (1503,9572 + j28,407)}$ $= \frac{34641,01615}{\sqrt{1509,1322^2 + 37,9752^2}} = 22,95 \text{ A}$
Sidoyoso	0	$\frac{34641,01615}{2 \times (0 + j1,0696) + (1500 + j9,8)}$ $= \frac{34641,01615}{\sqrt{1500^2 + 11,9392^2}} = 23,09 \text{ A}$
	25	$\frac{34641,01615}{2 \times (0,6249 + j1,8545) + (1500,9691 + j13,5784)}$ $= \frac{34641,01615}{\sqrt{1502,2189^2 + 17,2874^2}} = 23,05 \text{ A}$

	50	$\frac{34641,01615}{2 \times (1,2499 + j2,6394) + (1501,9382 + j17,3568)}$ $= \frac{34641,01615}{\sqrt{1504,438^2 + 22,6356^2}} = 23,02 \text{ A}$
	75	$\frac{34641,01615}{2 \times (1,8748 + j3,4243) + (1502,9072 + j21,1351)}$ $= \frac{34641,01615}{\sqrt{1506,6568^2 + 27,9837^2}} = 22,98 \text{ A}$
	100	$\frac{34641,01615}{2 \times (2,4998 + j4,2092) + (1503,8763 + j24,9135)}$ $= \frac{34641,01615}{\sqrt{1508,8759^2 + 33,3319^2}} = 22,95 \text{ A}$
Rangkah	0	$\frac{34641,01615}{2 \times (0 + j1,0696) + (1500 + j9,8)}$ $= \frac{34641,01615}{\sqrt{1500^2 + 11,9392^2}} = 23,09 \text{ A}$
	25	$\frac{34641,01615}{2 \times (0,6317 + j1,863) + (1500,9795 + j13,6189)}$ $= \frac{34641,01615}{\sqrt{1502,2429^2 + 17,3449^2}} = 23,05 \text{ A}$
	50	$\frac{34641,01615}{2 \times (1,2634 + j2,6564) + (1501,9589 + j17,4379)}$ $= \frac{34641,01615}{\sqrt{1504,4857^2 + 22,7507^2}} = 23,02 \text{ A}$
	75	$\frac{34641,01615}{2 \times (1,8951 + j3,4497) + (1502,9385 + j21,2569)}$ $= \frac{34641,01615}{\sqrt{1506,7287^2 + 28,1563^2}} = 22,98 \text{ A}$
	100	$\frac{34641,01615}{2 \times (2,5268 + j4,3431) + (1503,9179 + j25,0759)}$ $= \frac{34641,01615}{\sqrt{1508,9715^2 + 33,7621^2}} = 22,95 \text{ A}$

Lampiran C.4. Tabel Hasil Perhitungan TMS dan Waktu OCR

Penyulang	% Panjang	Gangguan Hubung Singkat 3 Fasa		
		Arus (A)	TMS	Waktu (t)
Tuwowo	0	18698,579	0,217736444	0,3
	25	9968,61	0,188225888	0,3
	50	6651,12	0,169436294	0,3
	75	4969,88	0,15599992	0,3
	100	3961,925	0,145602067	0,3
Wiratno	0	18698,579	0,237980874	0,3
	25	9522,56	0,206065697	0,3
	50	6250,05	0,18636734	0,3
	75	4633,65	0,172468816	0,3
	100	3677,14	0,16178702	0,3
Sidoyoso	0	18698,579	0,208372434	0,3
	25	10219,96	0,180135573	0,3
	50	6848,4	0,161610669	0,3
	75	5123,03	0,148271117	0,3
	100	4085,35	0,137923138	0,3
Rangkah	0	18698,579	0,237466148	0,3
	25	10166,81	0,208634655	0,3
	50	6799,16	0,189789091	0,3
	75	5081,35	0,176242218	0,3
	100	3980,36	0,164943134	0,3

Lampiran C.5. Tabel Hasil Perhitungan TMS dan Waktu OCR

Penyulang	% Panjang	Gangguan Hubung Singkat 2 Fasa		
		Arus (A)	TMS	Waktu (t)
Tuwowo	0	16193,45	0,210955214	0,3
	25	8633,07	0,18152942	0,3
	50	5760,04	0,162793808	0,3
	75	4304,04	0,149396	0,3
	100	3431,127	0,139028031	0,3
Wiratno	0	16193,45	0,231141488	0,3
	25	8246,78	0,199317985	0,3
	50	5412,71	0,179676276	0,3
	75	4012,85	0,165817511	0,3
	100	3184,5	0,155166548	0,3
Sidoyoso	0	16193,45	0,201618104	0,3
	25	8850,75	0,173462369	0,3
	50	5930,88	0,154990591	0,3
	75	4436,68	0,141689484	0,3
	100	3538,01	0,131371083	0,3
Rangkah	0	16193,45	0,230628242	0,3
	25	8804,72	0,201879579	0,3
	50	5888,25	0,183088167	0,3
	75	4400,57	0,169580087	0,3
	100	3447,09	0,158313509	0,3

Lampiran C.6. Tabel Hasil Perhitungan TMS dan Waktu DGR

Penyulang	% Panjang	Gangguan Hubung Singkat 1 Fasa Ke Tanah		
		Arus (A)	TMS	Waktu (t)
Tuwowo	0	23,09	0,050295782	Instant
	25	23,05	0,050170193	Instant
	50	23,02	0,050075862	Instant
	75	22,98	0,049949898	Instant
	100	22,95	0,049855285	Instant
Wiratno	0	23,09	0,050295782	Instant
	25	23,05	0,050170193	Instant
	50	23,02	0,050075862	Instant
	75	22,98	0,049949898	Instant
	100	22,95	0,049855285	Instant
Sidoyoso	0	23,09	0,050295782	Instant
	25	23,05	0,050170193	Instant
	50	23,02	0,050075862	Instant
	75	22,98	0,049949898	Instant
	100	22,95	0,049855285	Instant
Rangkah	0	23,09	0,050295782	Instant
	25	23,05	0,050170193	Instant
	50	23,02	0,050075862	Instant
	75	22,98	0,049949898	Instant
	100	22,95	0,049855285	Instant