MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

NATIONAL TECHNICAL UNIVERSITY
«KHARKIV POLYTECHNIC INSTITUTE»

Department	Power stations
Specialty	141 «Electric Power Engineering, Electrical Engineering and Electromechanics»
Educational program	Electric Power Engineering (141.01 – «Electric Power Stations», 141.05 – «Energy Management and Energy Efficient Technologies»)
Form of education	Full-time
Academic discipline	Mathematical Tasks of Power Engineering
Semester	5

INDIVIDUAL ASSIGNMENTS

Number of tickets _____

Approved at the meeting of the department
Protocol № from 20 .

Head of Department
_____ Oleksandr LAZURENKO

Examiner
_____ Liudmyla LYSENKO

Determine the steady-state operation parameters for a power system in accordance with the variant with application of Gauss's method. Check the active power balance in the power system.

The initial data for the calculations are given in tables 1 – 3.

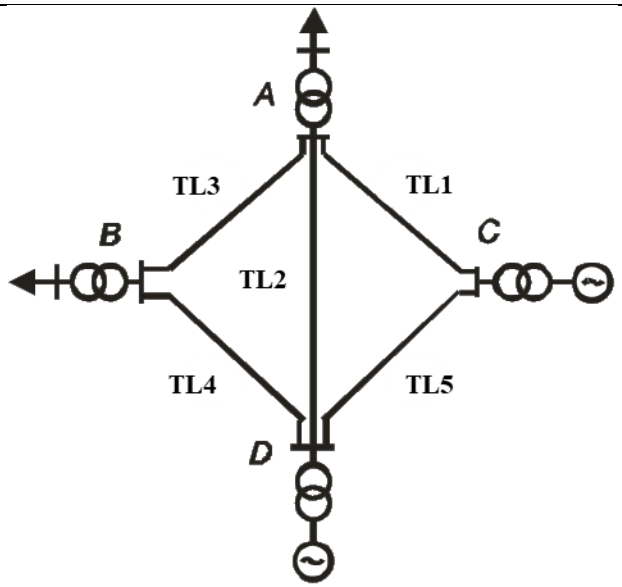
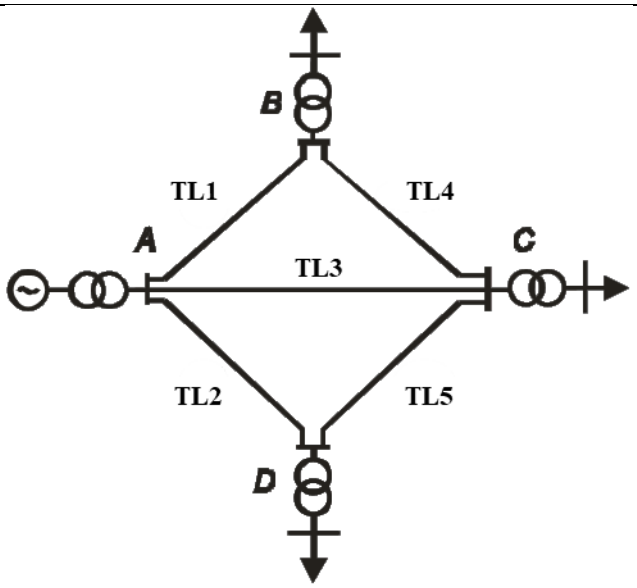
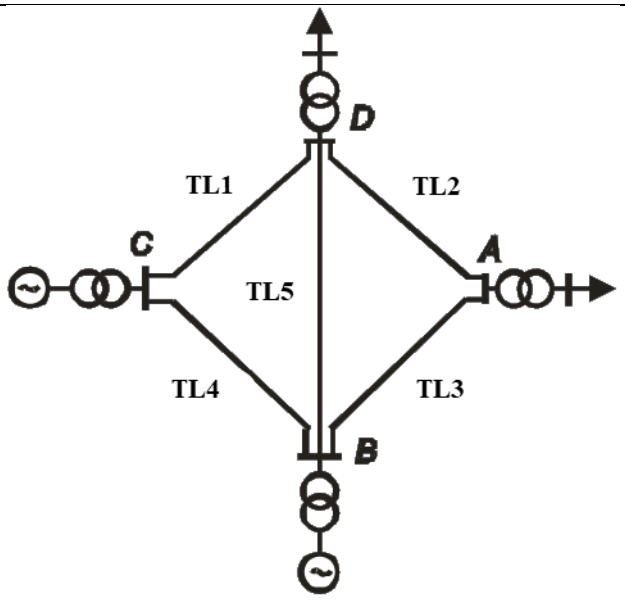
Table 1 – Initial system parameters

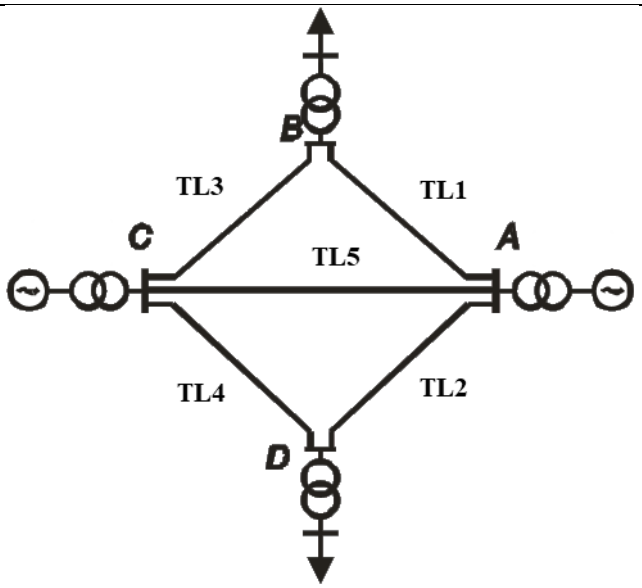
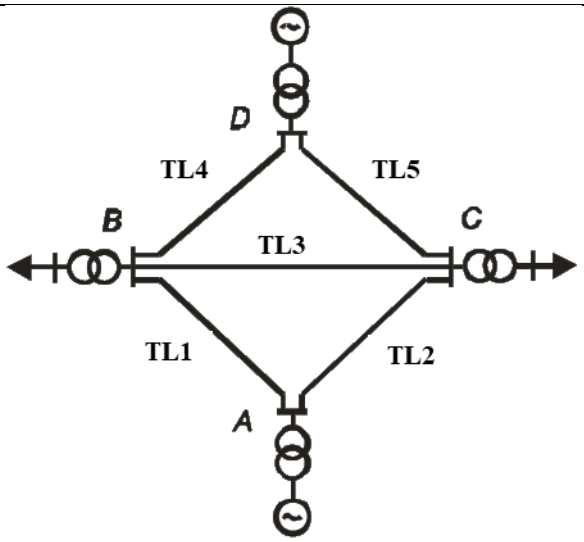
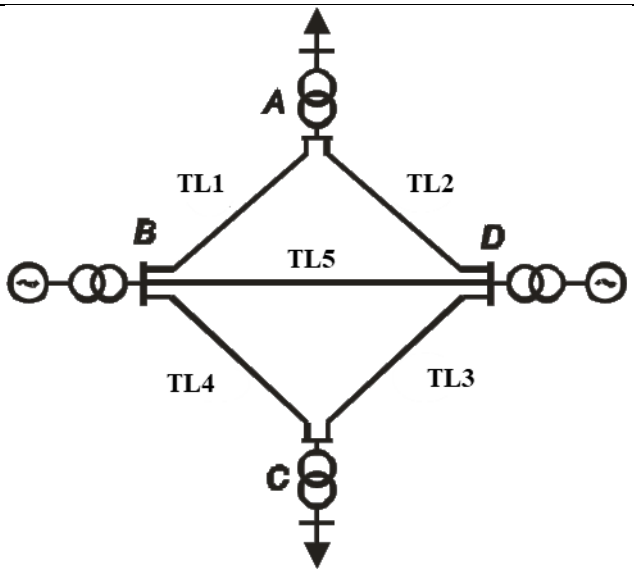
№ variant	№ configuration	Z_1, Ω	Z_2, Ω	Z_3, Ω	Z_4, Ω	Z_5, Ω
1	1	$10+j20$	$12+j25$	$15+j30$	$15+j25$	$10+j18$
2	5	$15+j25$	$10+j16$	$16+j24$	$12+j20$	$15+j30$
3	3	$10+j20$	$8+j15$	$12+j20$	$15+j25$	$12+j24$
4	6	$12+j20$	$16+j29$	$14+j25$	$10+j17$	$8+j16$
5	4	$12+j22$	$16+j24$	$10+j16$	$8+j15$	$15+j30$
6	7	$9+j20$	$10+j22$	$15+j28$	$14+j25$	$10+j18$
7	3	$10+j20$	$12+j20$	$15+j30$	$10+j25$	$10+j18$
8	2	$8+j16$	$10+j18$	$12+j24$	$9+j20$	$15+j30$
9	1	$10+j18$	$12+j22$	$8+j14$	$14+j25$	$11+j20$
10	5	$9+j18$	$10+j22$	$15+j30$	$14+j24$	$10+j18$

Table 3 – Initial data on the power system operation

№ variant	V_{ref}, kV	J_{aA} / J_{rA}, кА	J_{aB} / J_{rB}, кА	J_{aC} / J_{rC}, кА	J_{aD} / J_{rD}, кА
1	110	0,2922 / 0,1461	0,4199/ 0,2099	0,3512/ 0,2177	Reference node
2	115	Reference node	0,3711 / 0,1856	0,4421 / 0,2211	0,6812 / 0,4087
3	115	0,4235 / 0,2118	Reference node	0,3793 / 0,2352	0,4721 / 0,2361
4	110	0,3536 / 0,1768	0,2924/ 0,1813	Reference node	0,4133 / 0,2177
5	110	Reference node	0,4212 / 0,2106	0,3399 / 0,2109	0,2852 / 0,1525
6	115	0,1077 / 0,0538	0,2599 / 0,1299	0,1507 / 0,0754	Reference node
7	110	0,3655 / 0,1827	Reference node	0,4512/ 0,2797	0,4399 / 0,264
8	115	Reference node	0,2099 / 0,1049	0,3133 / 0,1566	0,1499 / 0,0749
9	115	0,2753 / 0,1379	0,4222 / 0,2112	Reference node	0,3512/ 0,2177
10	110	0,3944 / 0,2445	0,2692 / 0,1348	0,3484 / 0,1742	Reference node

Table 3 – Variant of power system configuration

№	Power system configuration
1	
2	
3	

4	 B TL3 TL1 C A TL5 TL4 TL2 D
5	 D TL4 TL5 B C TL3 TL1 TL2 A
6	 A TL1 TL2 B D TL5 TL4 TL3 C

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