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	Automatic Control Theory in Problems of Electricity and Energy Efficiency
Semester	3

INDIVIDUAL ASSIGNMENTS

Number of tickets _____

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

Head of Department
_____ Oleksandr LAZURENKO

Examiner
_____ Liudmyla LYSENKO

In accordance with the variant:

1 – Calculate the parameters and build a Simulink model of a separately excited dc motor, study the motor operation in the various mode.

2 – Calculate parameters of a PI regulator for the motor and make simulation of the control system “PI-regulator – DC motor”.

3 – Make mathematical description of the control system: determine the transfer functions for the reference (voltage) and disturbance (load current) signals, the complete differential equation, plot time and frequency characteristics.

4 – Study stability of the control system with Hurwitz, Mikhailov, Nyquist criteria; determine the system stability margins with open-loop Bode plot.

5 – Determine the time domain specifications and steady-state error.

The initial data for the computations are given in table 1

Table 1 Variants of initial data

№ variant	Motor type	P_{rated}, kW	n_r, rpm	I_{load}, A	R_A+R_{AP}, Ω	J, kg·m^2	Φ, mWb	$2p$
1	P42	1.5	750	9.75	2.92	0.18	5.1	4
2	P42	2.2	1000	13.3	1.75	0.18	5.2	4
3	P42	4.5	1500	25.4	0.78	0.18	5.1	4
4	P52	3.2	750	19.0	1.078	0.40	7.7	4
5	P52	4.5	1000	25.2	0.632	0.40	7.9	4
6	P52	8.0	1500	43.5	0.259	0.40	8.2	4
7	P62	6.0	750	33.5	0.531	0.65	10.5	4
8	P62	8.0	1000	43.0	0.328	0.65	10.7	4
9	P62	14.0	1500	73.5	0.1275	0.65	11.1	4
10	P71	7.0	750	42.0	0.546	1.4	9.2	4
11	P71	10.0	1000	63.0	0.300	1.4	9.7	4
12	P71	19.0	1500	103.0	0.1235	1.4	10.1	4