CONTROL OF NONLINEAR DYNAMICS OF ELECTROMECHANICAL SYSTEMS

Author: Konechnyy S.V.

CONTENTS

1 Problem statement

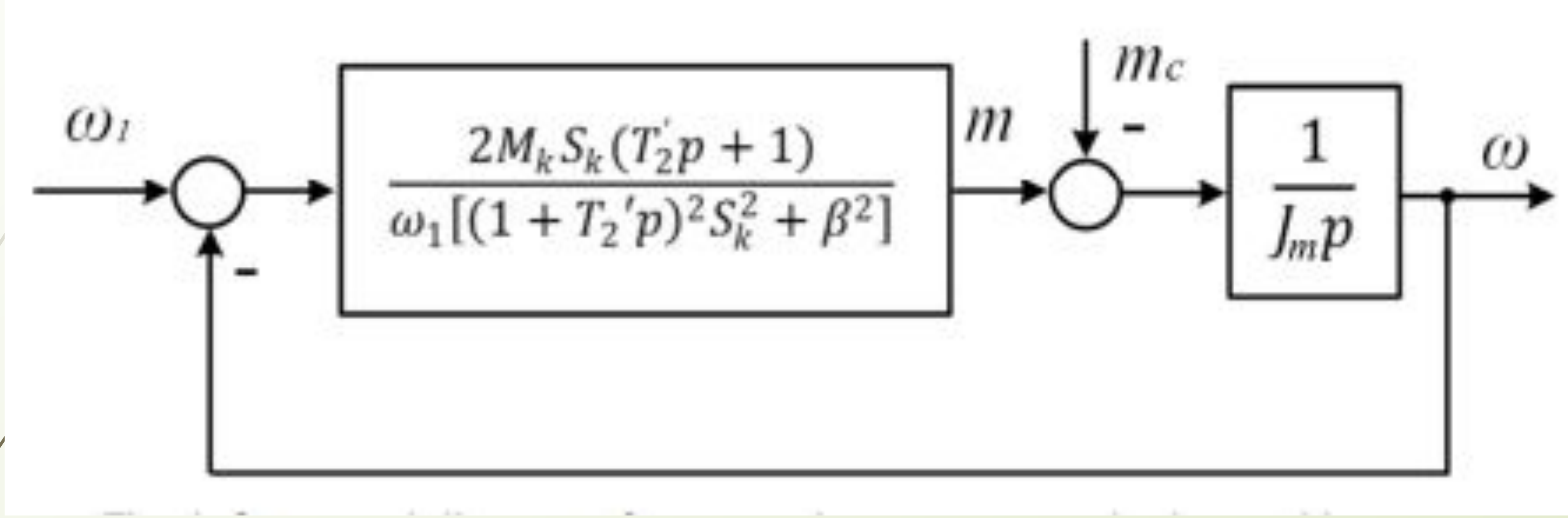
$$m = \frac{2M_k}{(1+T_2'p)\left[\frac{S_k}{\beta}(1+T_2'p)\right]+\frac{\beta}{S_k}}, \quad (1)$$

where $T_2' = \frac{L_k}{R_2}$ – the transient time constant of the rotor, $\beta = \frac{\omega_2}{\omega_1}$ – the relative slip, M_k – the critical moment, S_k – the critical slip at the nominal frequency ω_{1nom}.

$$m = \frac{2M_k}{(1+T_2'p)\frac{S_k}{\beta}} = \frac{2M_k\beta}{(1+T_2'p)S_k} = \frac{2M_k(\omega_1-\omega)}{(1+T_2'p)S_k\omega_1}.$$

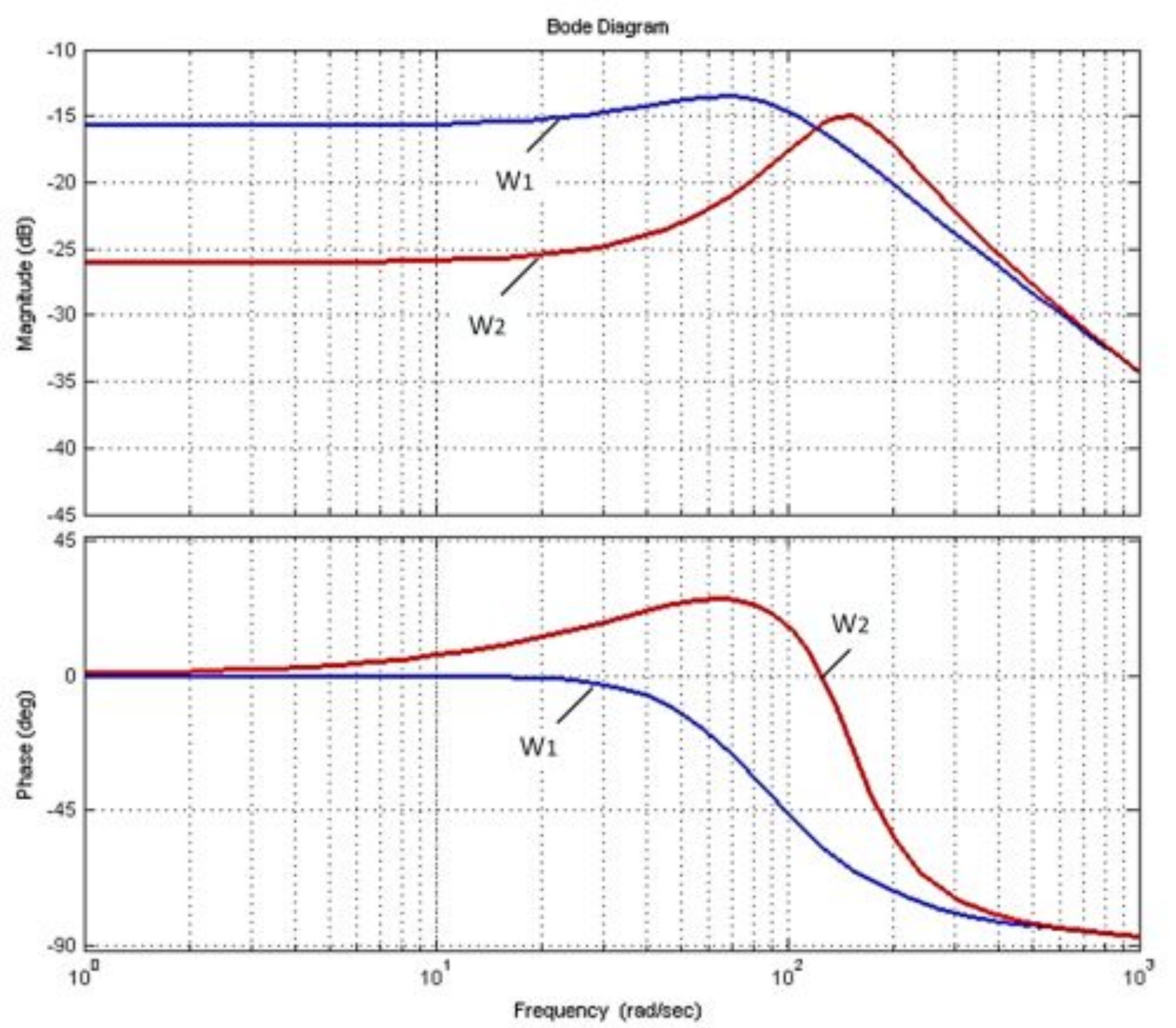
$$W_D(p) = \frac{m}{\Delta\omega} = \frac{2M_k}{(1+T_2'p)S_k\omega_1}. \quad (2)$$

2 Solution

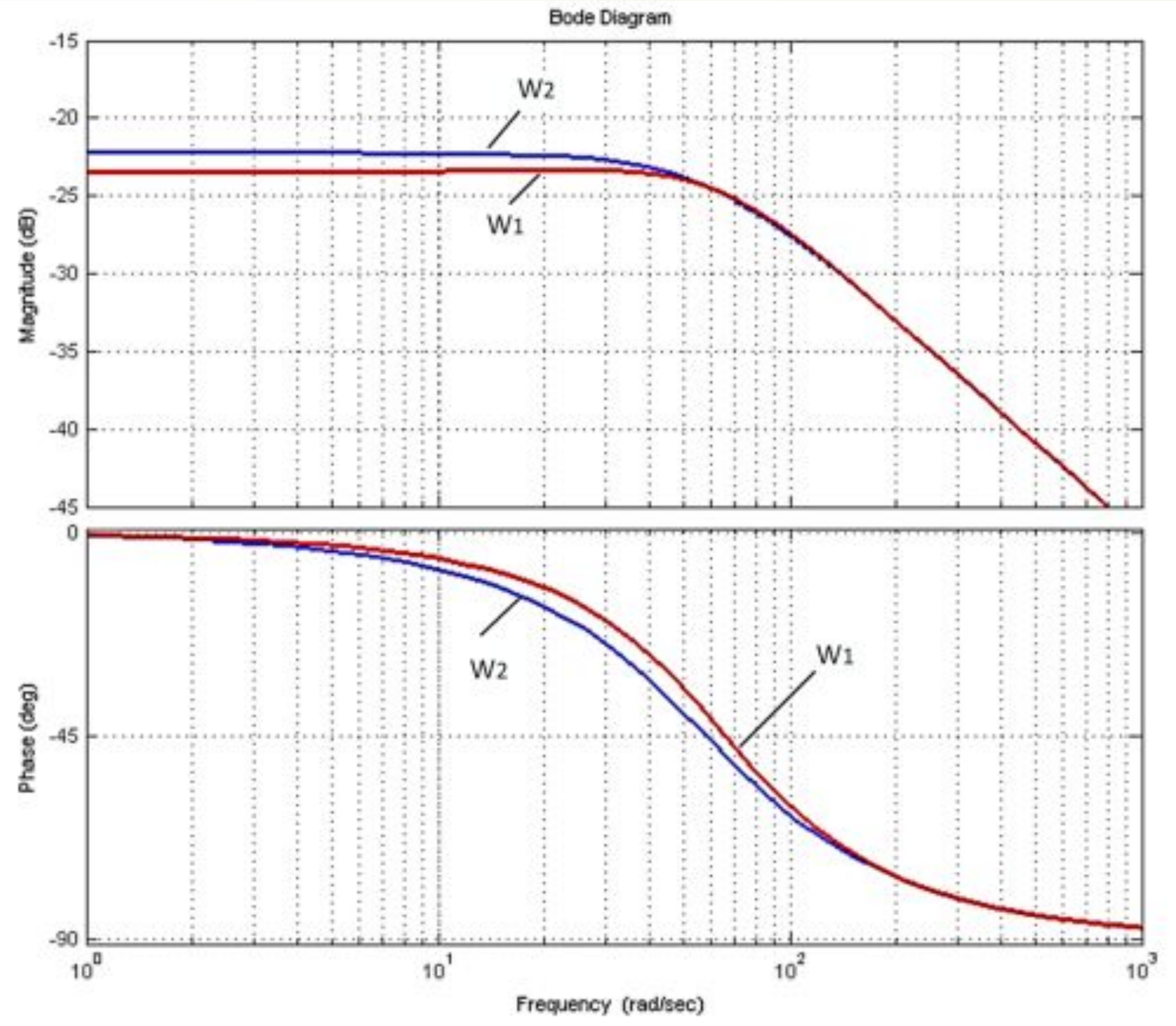


$$W(p) = \frac{2M_k(T_2' p+1)S_k}{\omega_1[(1+T_2' p)^2 S_k^2+\beta^2]},$$

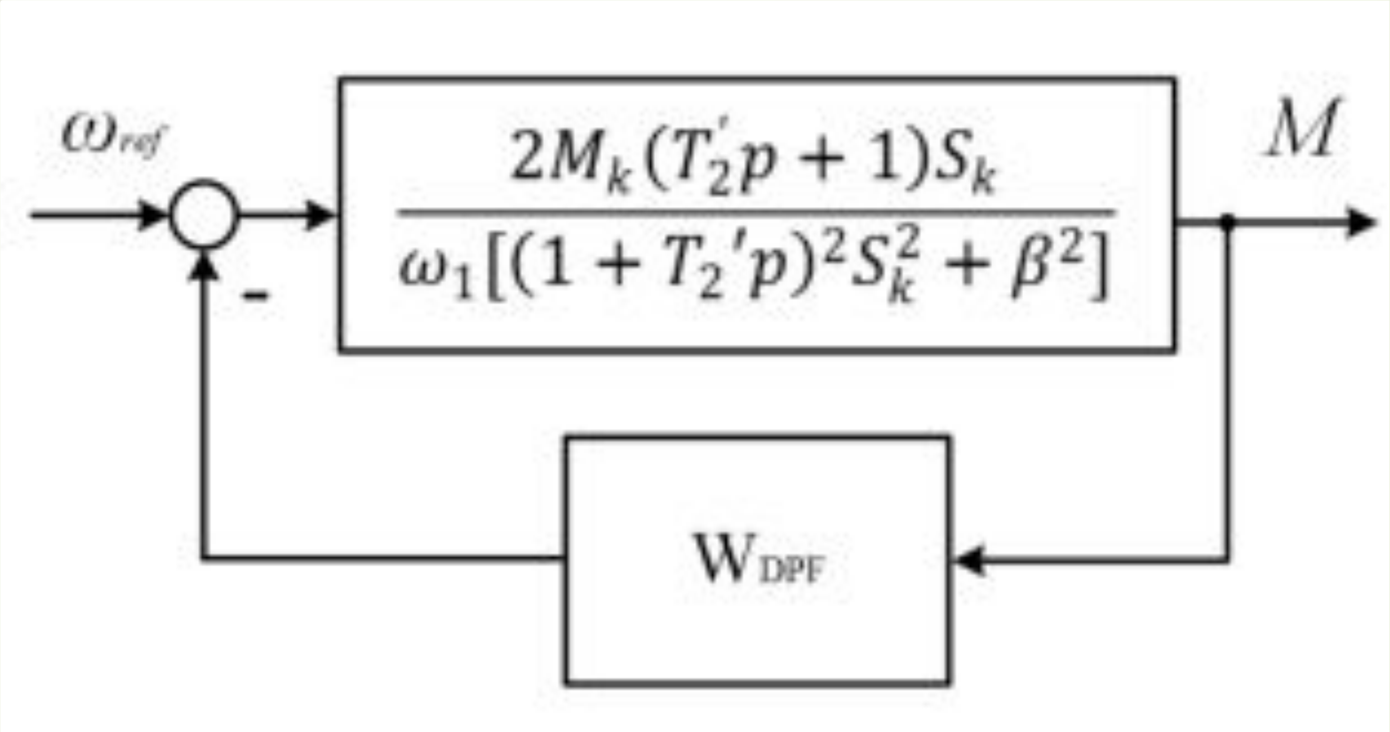
3 Simulation results



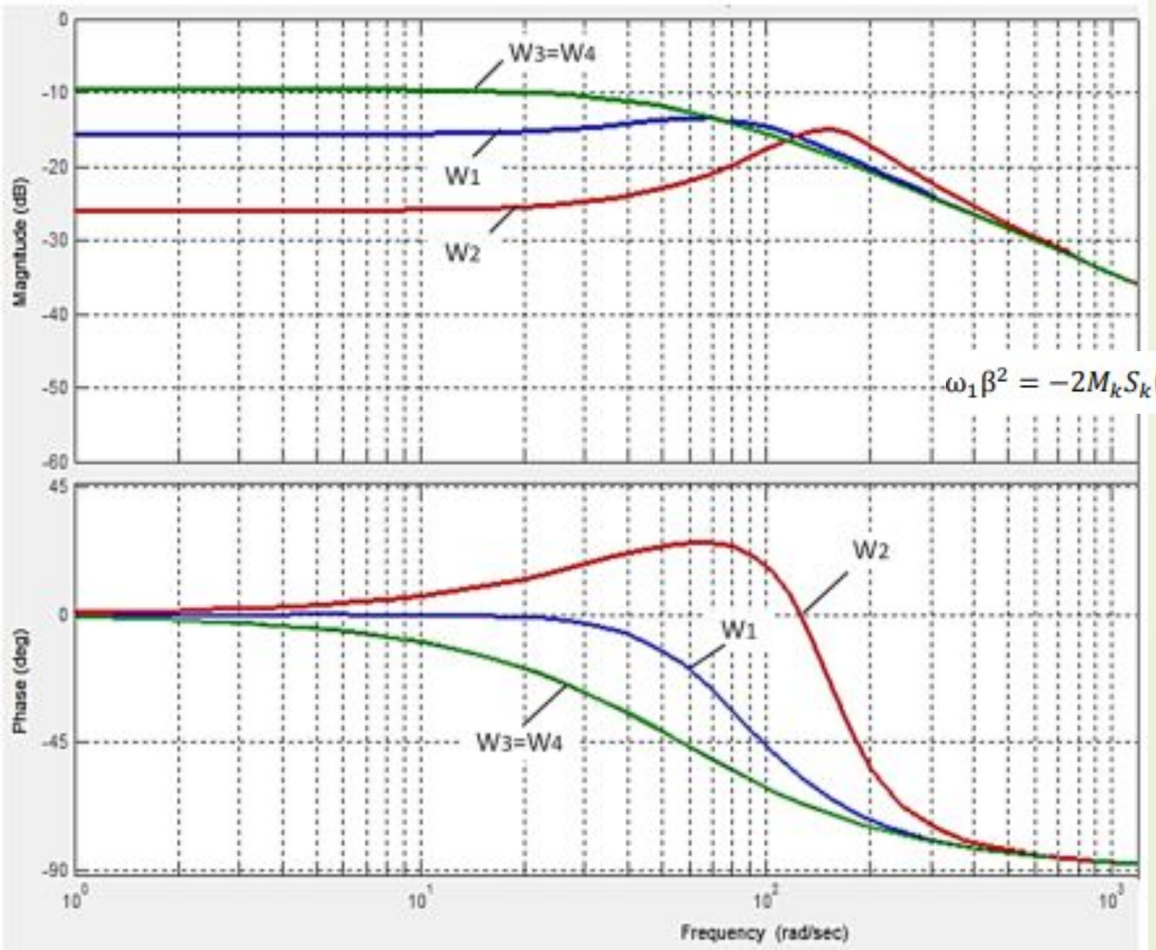
3 Simulation results



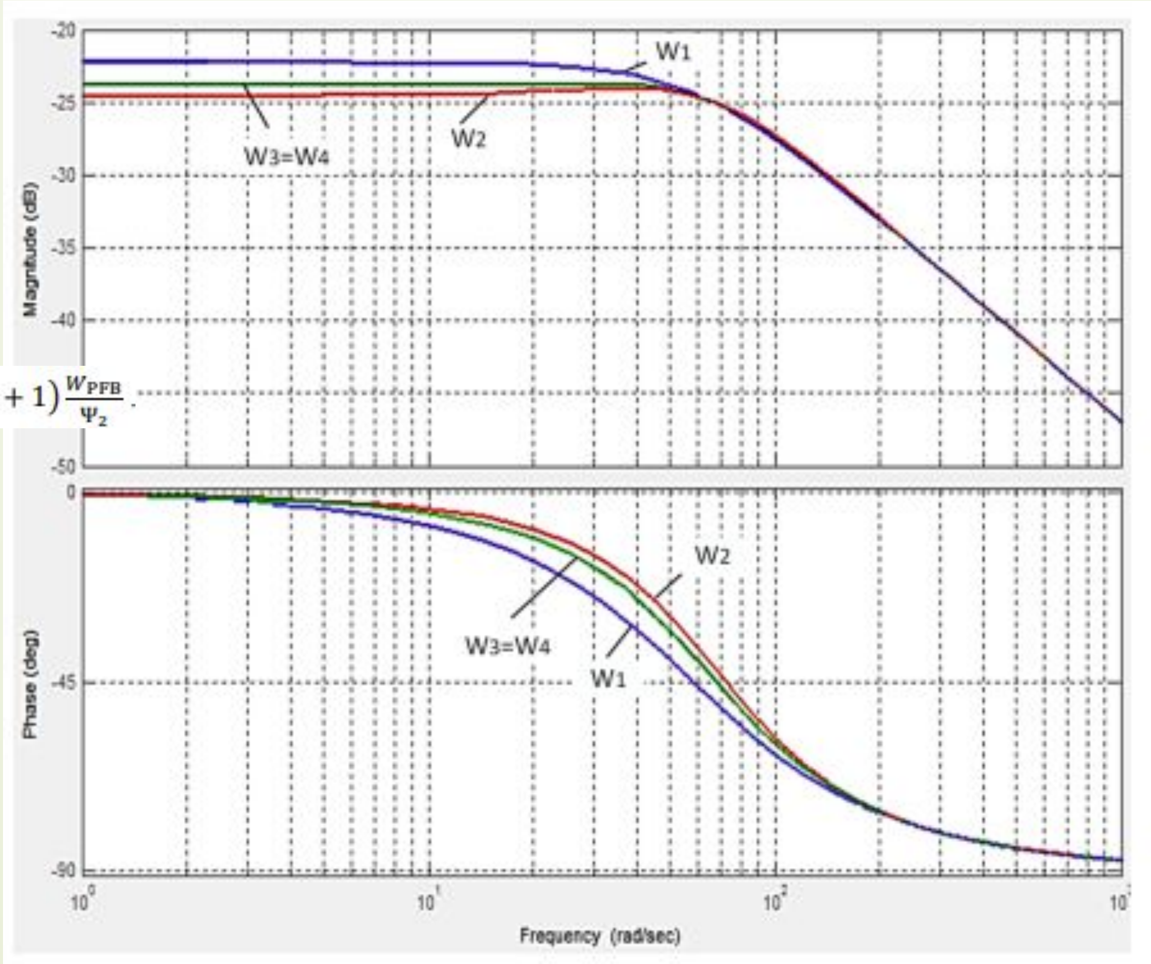
3 Simulation results



3 Simulation results



$$\omega_1\beta^2 = -2M_kS_k\left(T_2'p+1\right)\frac{W_{PFB}}{\Psi_2}.$$

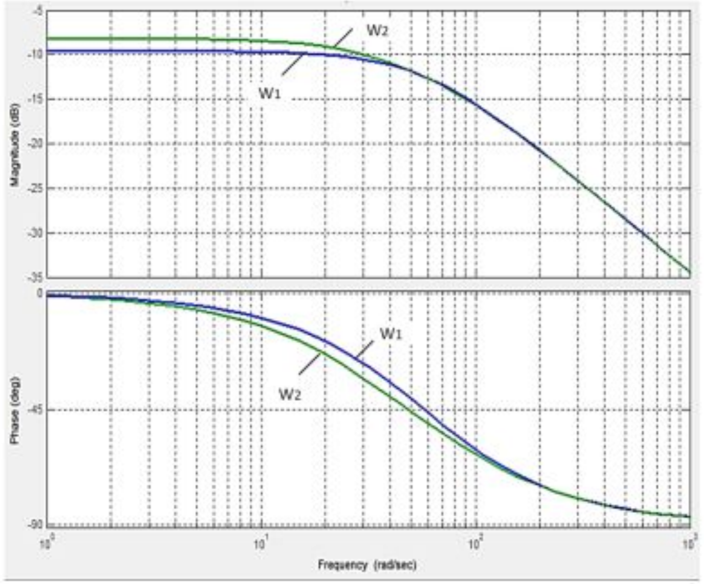


3 Simulation results

This expression shows that when controlling the flux linkage, the linearization conditions can be r fined, thereby ensuring high quality regulation.

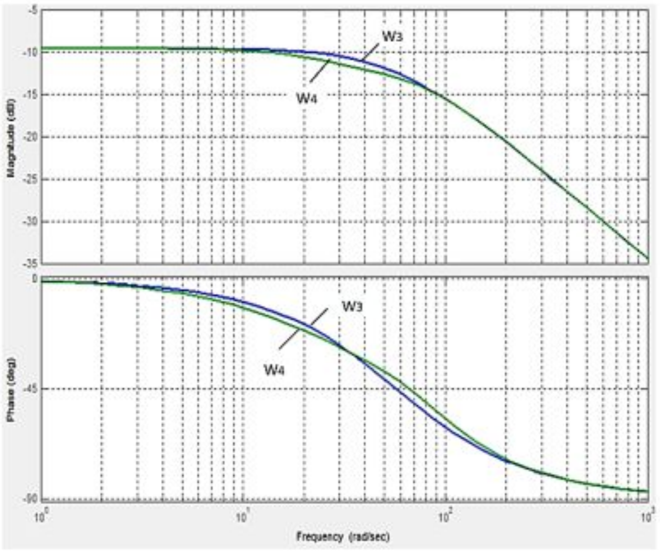
$$\omega_1 \beta^2 = -2M_k S_k (T_2' p + 1) \frac{W_{PFB}}{\Psi_2}.$$

3 Simulation results



$$W_{\text{PFB 1}} = \frac{3{,}84}{0{,}0038p + 0{,}226}$$

$$W_{\text{PFB 2}} = \frac{4}{0{,}0038p + 0{,}226}$$



$$W_{\text{PFB 1}} = \frac{3{,}84}{0{,}0038p + 0{,}226}$$

$$W_{\text{PFB 2}} = \frac{3{,}84}{0{,}0042p + 0{,}226}$$

Conclusion

In conclusion, the proposed method for analyzing processes in an asynchronous drive with frequency control according to changing transfer functions and frequency characteristic made it possible to propose an effective correction, in terms of controllability of a nonlinear dynamic structure, allowing increase its effectiveness.

THANKS FOR THE ATTENTION!