Quizzes of TTK4225 - Systems Theory, Autumn 2020

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Question 144

Consier a generic matrix $A \in \mathbb{R}^{n \times n}$, and its characteristic polynomial, i.e., the scalars $\alpha_0, \alpha_1, \ldots, \alpha_{n-1}$ such that

$$A^n = -\alpha_{n-1} A^{n-1} - \ldots - \alpha_1 A - \alpha_0 I$$

and forming the polynomial

$$s^n + \alpha_{n-1} s^{n-1} + \ldots + \alpha_1 s + \alpha_0 .$$

Then the characteristic polynomial is the lowest order polynomial that is nullified by A. I.e., there are no other scalars $\beta_0, \beta_1, \ldots, \beta_{m-1}$ with $m < n$ such that

$$A^m = -\beta_{m-1} A^{m-1} - \ldots - \beta_1 A - \beta_0 I$$

1. true
2. false
3. it depends
4. I don't know

Question 145

Assume that a system is s.t. its state update matrix A is s.t. $A^m = \mathbf{0}$ for some m. How does this help computing the forced response of the system?

Question 146

Consider a real symmetric $n \times n$ matrix. Is it possible to diagonalize it, or may there exist cases for which it is not possible to diagonalize it? Why?

Question 147

Consider a LTI system of order 5 for which all its poles are distinct. Must the associated impulse response comprise at least one mode of the type $e^{\lambda t}$? If so, why?

Question 148

Consider a LTI system of order 4 for which all its poles are distinct. Must the associated impulse response comprise at least one mode of the type $e^{\lambda t}$? If so, why?