Quizzes of TTK4225 - Systems Theory, Autumn 2020

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Question 130

If a $n \times n$ square matrix has n different eigenvalues then it is diagonalizable

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

Question 131

A $n \times n$ square matrix needs to have n different eigenvalues to be diagonalizable

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

Question 132

A 2×2 projection matrix, i.e., a matrix that projects elements of $\mathbb{R}^2$ onto a line passing by the origin, must have an eigenvalue equal to . . .

1. -1
2. 0
3. 1
4. it depends
5. I don't know

Question 133

A 2×2 projection matrix, i.e., a matrix that projects elements of $\mathbb{R}^2$ onto a line passing by the origin, must have a kernel . . .

1. that is equal to $\{\mathbf{0}\}$
2. that has dimension 1
3. that has dimension 2
4. it depends
5. I don't know

Question 134

A 2×2 rotation matrix, i.e., a matrix that performs a rotation of the Cartesian space, must have a determinant equal to . . .

1. 0
2. 1
3. either 1 or -1
4. it depends
5. I don't know

Question 135

Consider a critically damped spring-mass system written in a two-dimensional state-space form. How will the eigenspaces of the state update matrix look like?

1. there will be one, of dimension one
2. there will be one, of dimension two
3. there will be two, each of dimension one
4. there will be two, each of dimension two
5. I don't know

Question 136

Consider two LTI systems written in state space form, one for which its state update matrix is diagonalizable, and one not-diagonalizable, but having the same characteristic polynomial. How will the requirements for the BIBO stability change between the two systems?

1. they will be the same
2. the non-diagonalizable system must have all its Jordan miniblocks of order 1
3. the non-diagonalizable system must have all the Jordan miniblocks corresponding to eigenvalues on the imaginary axis of order 1
4. the non-diagonalizable system must have all the eigenvalues corresponding to the Jordan miniblocks with real part strictly negative
5. I don't know

Question 137

Consider an underdamped spring-mass system written in a two-dimensional state-space form. How will the eigenspaces of the state update matrix look like?

Question 138

Consider the impulse response

$$h(t) = 2e^{-t} + 3te^{-t} + 4e^{-2t}.$$

What is the dimension of the state-space LTI system generating this response?

1. 2
2. 3
3. 4
4. we cannot know
5. I don't know

Question 139

If a LTI system is controllable, then it is also reachable

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

Question 140

Can we have $BA \neq \mathbf{0}$ even if $AB = \mathbf{0}$?

Question 141

Which is more correct to say among these two options?

1. a matrix defines a specific linear transformation
2. a matrix defines a specific linear transformation from a specific basis into another

1. the first
2. the second
3. they are equivalent
4. I don't know

Question 142

Assume that a LTI system admits a rational transfer function with two distinct zeros and three distinct poles. Then the associated minimal state space system realizing that transfer function has its state update matrix ...

1. diagonalizable
2. diagonalizable if there are no poles-zeros cancellations
3. non-diagonalizable
4. I don't know