Quizzes of TTK4225 - Systems Theory, Autumn 2020

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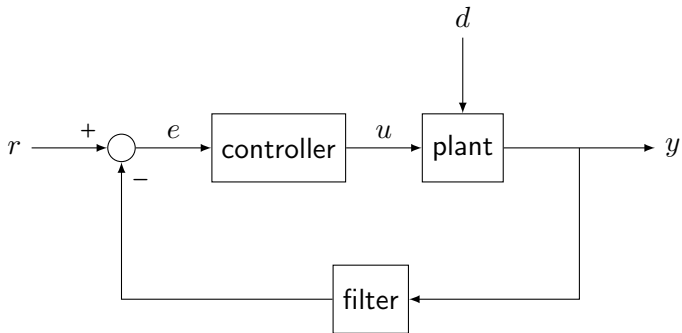
Question 1

automatic control is . . .

1. applying mechanisms so to operate processes manually but smartly, so they need little direct human intervention

2. applying mechanisms so to operate processes automatically, so they don't need continuous direct human intervention

3. applying mechanisms so to analyse processes numerically, so they can be controlled when there is some direct human intervention

4. I do not know

Question 2

This is the only type of control we can do control:

1. true
2. false
3. it depends
4. I do not know

Question 3

TTK4225 is about learning how to design control systems

1. true
2. false
3. it depends
4. I do not know

Question 4

in our acception, dynamics means . . .

1. the study of the motion of the variables that characterize a system
2. the physics concerned with the effects of forces on the motion of bodies
3. the study of the forces or processes that produce changes inside a group or system
4. I do not know

Question 5

the Lotka-Volterra and Van der Pol systems are intrinsically different mainly because
...

1. in the first each trajectory somehow is defined by the initial condition, while in the second they eventually are all the same independently of the initial condition

2. in the first one we have a connection with animal population dynamics, while in the second we have a connection with clocks

3. in the first each trajectory somehow stays by itself, while in the second there is a sort of limit cycle that attracts all the trajectories

4. I do not know

Question 6

modelling a dynamical system requires defining . . .

1. only the variables of the system
2. only the structure of the function connecting the various variables and variables' time derivatives
3. only the value of the parameters defining the function above
4. both the variables and the function
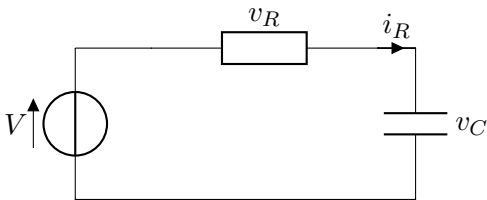5. all the ingredients above, i.e., variables, function, and value of the parameters
6. I do not know

Question 7

to simulate a system it is enough to have its model

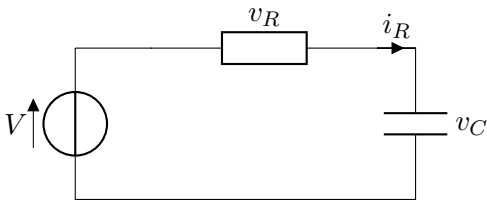1. true
2. false
3. it depends
4. I do not know

Question 8

which order is this system?
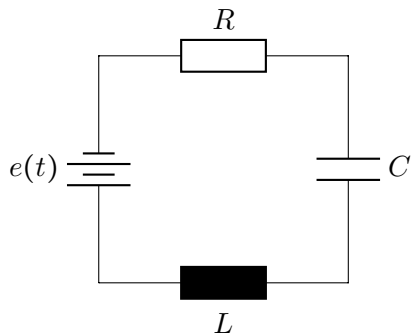

1. 1
2. 2
3. 3
4. 4+
5. I do not know

Question 9

is this system linear?

1. yes
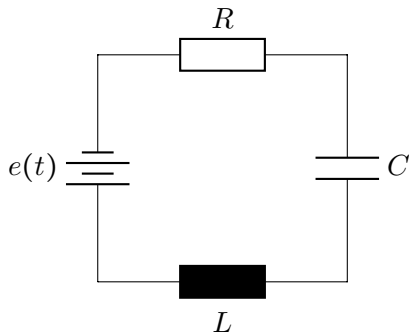2. no
3. it depends
4. I do not know

Question 10

which order is this system?

1 1
2 2
3 3
4 4+

Question 11
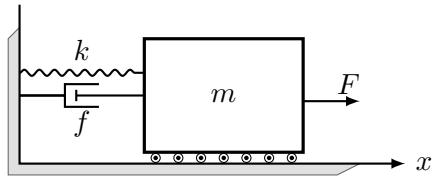
is this system linear?

1. yes
2. no
3. it depends
4. I do not know

Question 12
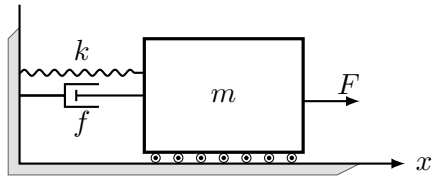
which order is this system?

1. 1
2. 2
3. 3
4. 4+
5. I do not know

Question 13

is this system linear?

1. yes
2. no
3. it depends
4. I do not know

Question 14

which order is this system?

$$\begin{cases} \dot{y}_1 & = \mu\left(y_1 - \dfrac{y_1^3}{3} - y_2\right) \\ \dot{y}_2 & = \dfrac{y_1}{\mu} \end{cases}$$

❶ 1

❷ 2

❸ 3

❹ 4+

❺ I do not know

Question 15

is this system linear?

$$\begin{cases} \dot{y}_1 & = \mu\left(y_1 - \dfrac{y_1^3}{3} - y_2\right) \\ \dot{y}_2 & = \dfrac{y_1}{\mu} \end{cases}$$

1. yes
2. no
3. it depends
4. I do not know

Question 16

the model-free feedback-based control paradigm, where u is built without knowing the dynamics f but rather built starting from an error e, is in first approximation a reactive way of doing control

1. true
2. false
3. it depends
4. I do not know

Question 17

where is $e^{-\frac{3}{4}\pi j}$?

1. on the real axis
2. on the bisector of the first and third quadrant
3. on the imaginary axis
4. on the bisector of the second and fourth quadrant
5. I do not know

Question 18

How would you describe a derivative, $\frac{d}{dx}$?

1. the instantaneous rate of change of something with respect to time
2. the instantaneous velocity of the variable
3. the tangent of a graph
4. the rate of change of something with respect to x
5. none of the above
6. I do not know

Question 19

Consider $f(x) = \dfrac{\sin x}{x}$. Is the limit $\lim\limits_{x \to 0} f(x) = f(0)$ correct?

1. no, since $f(x)$ is not continuous at $x = 0$, thus $f(0)$ is not defined

2. no, since the limit when $x \to 0$ does not exist

3. yes, since $\lim\limits_{x \to 0} f(x) = f(0) = \dfrac{0}{0} = 0$

4. yes, since $f(x)$ is not continuous at $x = 0$

5. none of the above

6. I do not know

Question 20

What is the expansion of the derivative $\dfrac{d}{dx}f(x)g(x)$?

1. $f'(x)g'(x)$
2. $\dfrac{f'(x)g(x) - f(x)g'(x)}{g(x)^2}$
3. $f(x)g'(x) - f'(x)g(x)$
4. $f'(x)g(x) + f(x)g'(x)$
5. I do not know

Question 21

is this matrix multiplication feasible?

$$\begin{bmatrix} \star & \star & \star \\ \star & \star & \star \end{bmatrix}\begin{bmatrix} \star & \star & \star \\ \star & \star & \star \\ \star & \star & \star \end{bmatrix}$$

1. yes
2. no
3. it depends
4. I do not know

Question 22

is this matrix multiplication feasible?

$$\begin{bmatrix} \star & \star & \star & \star \\ \star & \star & \star & \star \end{bmatrix} \begin{bmatrix} \star & \star & \star \\ \star & \star & \star \\ \star & \star & \star \end{bmatrix}$$

1. yes
2. no
3. it depends
4. I do not know