

Lab Sheet 3 – ANSWER SHEET

The RC circuit, single tank and bicycle systems

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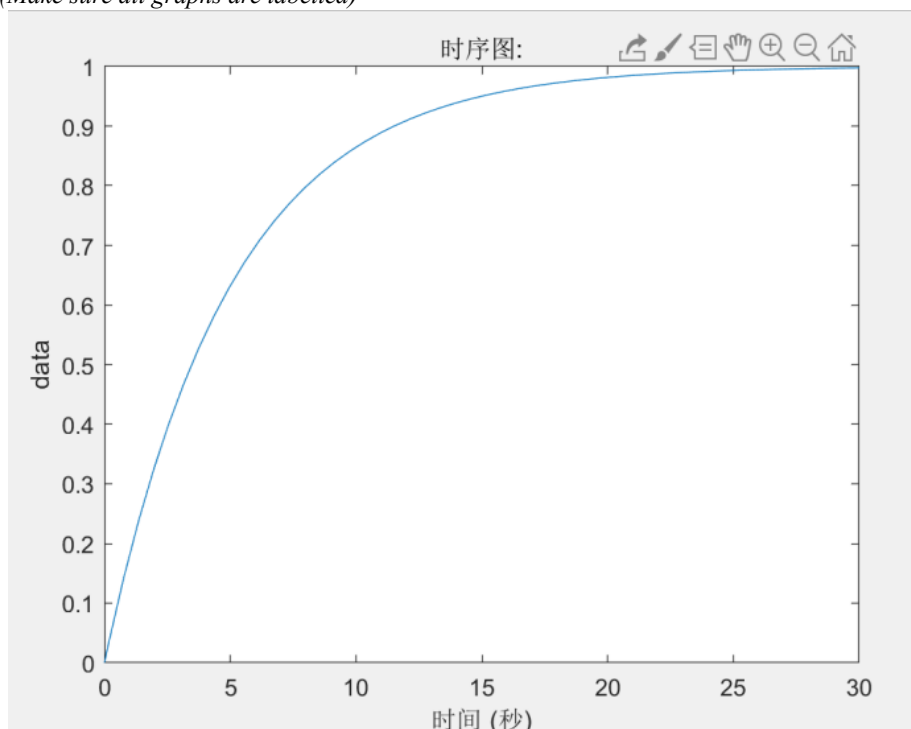
DATE: 2021.06.01

NUMBER: 832002117

Ex.1: The RC circuit

Plot of input and output attached? Yes

(Make sure all graphs are labelled)



Complete the following table:

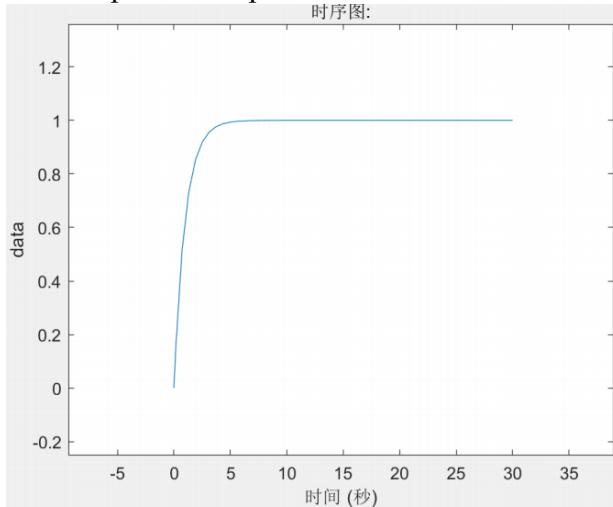
R (Ω)	C (F)	Time constant τ (s)	Output at τ	Final output
10	0.5	5	0.6321	1
10	0.1	1	0.6298	1
100	0.02	2	0.6267	1
1000	0.0025	2.5	0.6320	1

Comment on your results, i.e. what can you deduce about the time constant of the system?
(Hint – what is the relationship between the output at τ and the final output?)

The output at τ is approximately 0.632 times final output

Ex.2: The single tank

Plot of input and output attached? Yes

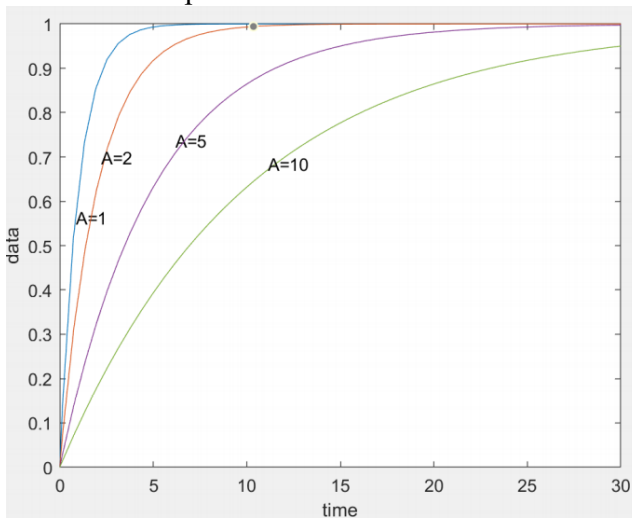


Determine the final value of the response:

1

The effect of A :

Plot of four outputs attached? Yes



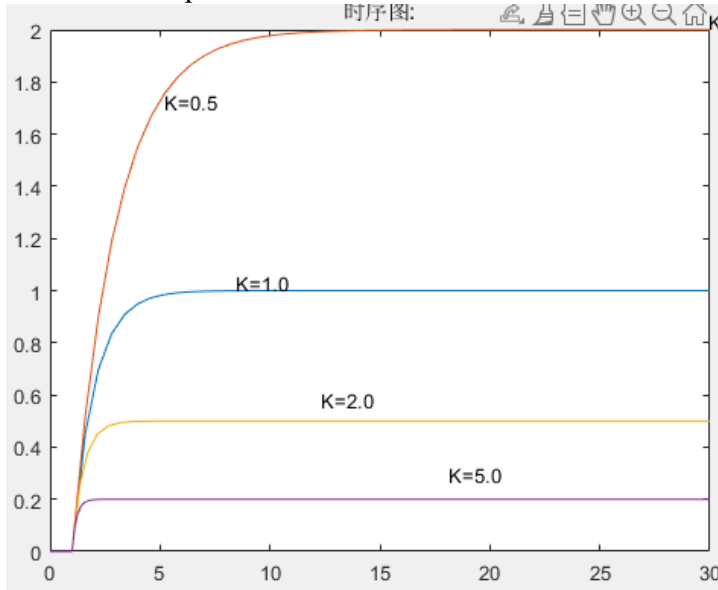
Comment on the results obtained, i.e. how does changing the cross-sectional area of the tank affect the time it takes to fill the tank? Is this what you would expect? Why?

A is positively related to time .And it is what I expect because the volume become bigger when cross-sectional area is bigger

The effect of k :

Plot of four outputs attached?

Yes



Comment on the results obtained, i.e. how does changing k affect the final height of the liquid in the tank?

The bigger k is, the smaller final height is.

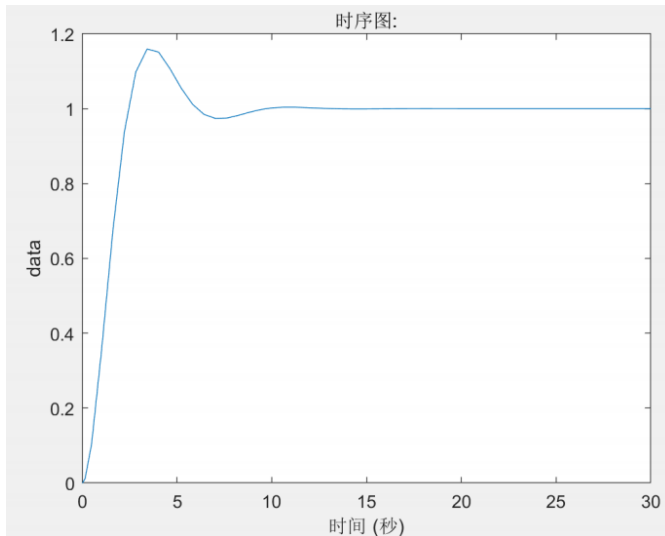
Relate the change in height to the resistance to flow R (as defined in section 3 of the lab sheet):

The bigger height is , the bigger resistance is.

Ex.3: The bicycle – mass-spring-damper

Plot of both input and output attached?

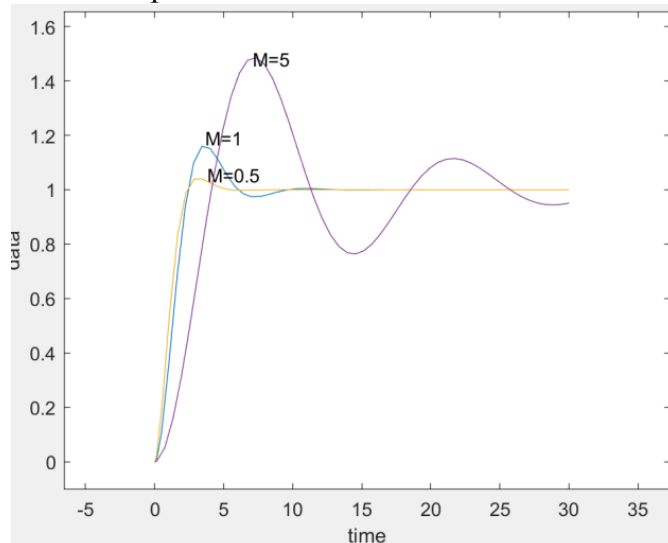
Yes



What is the final output of the system response?

The effect of mass M

Plot of 3 responses attached? Yes

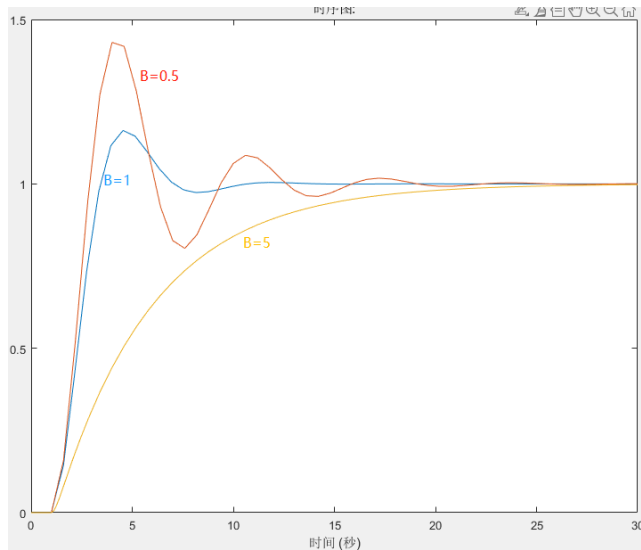


Comment on the results obtained, i.e. how does changing the mass of the system affect the position response of the system? Justify this in the context of the physical system.

The overshoot is bigger and in increased oscillation when M is bigger The system become stable more late when M is bigger

The effect of damper B :

Plot of 3 responses attached? Yes

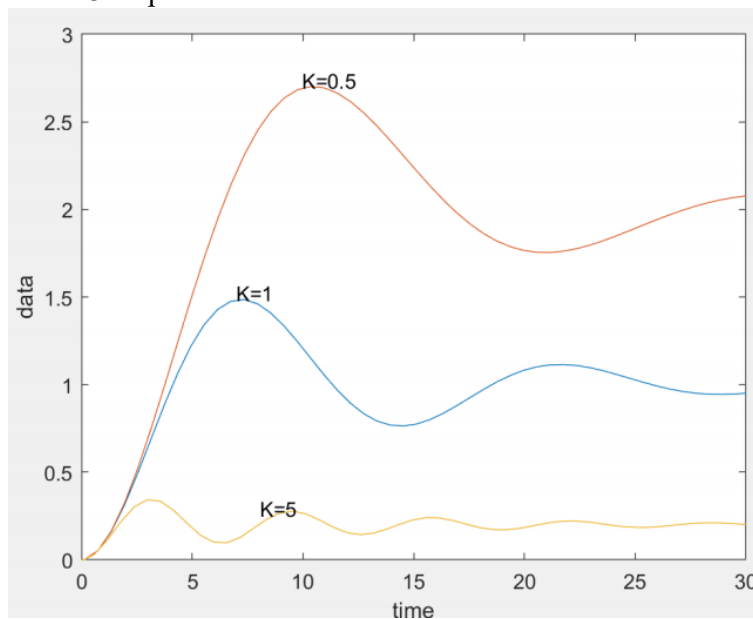


Comment on the results obtained, i.e. how does changing the damper coefficient of the system affect the position response of the system? Justify this in the context of the physical system.

The system will become more stable when the damper coefficient become bigger

The effect of spring K :

Plot of 3 responses attached? Yes



Comment on the results obtained, i.e. how does changing the spring coefficient of the system affect the position response of the system in terms of (i) its final output and (ii) its dynamics (the shape of the response)? Justify the latter in the context of the physical system.

The system become more stable and overshoot become smaller when K becomes bigger.