System modeling and simulation(ME340)

Chapter 9. Transient response and block diagram model

9.6 Modeling system with block diagrams

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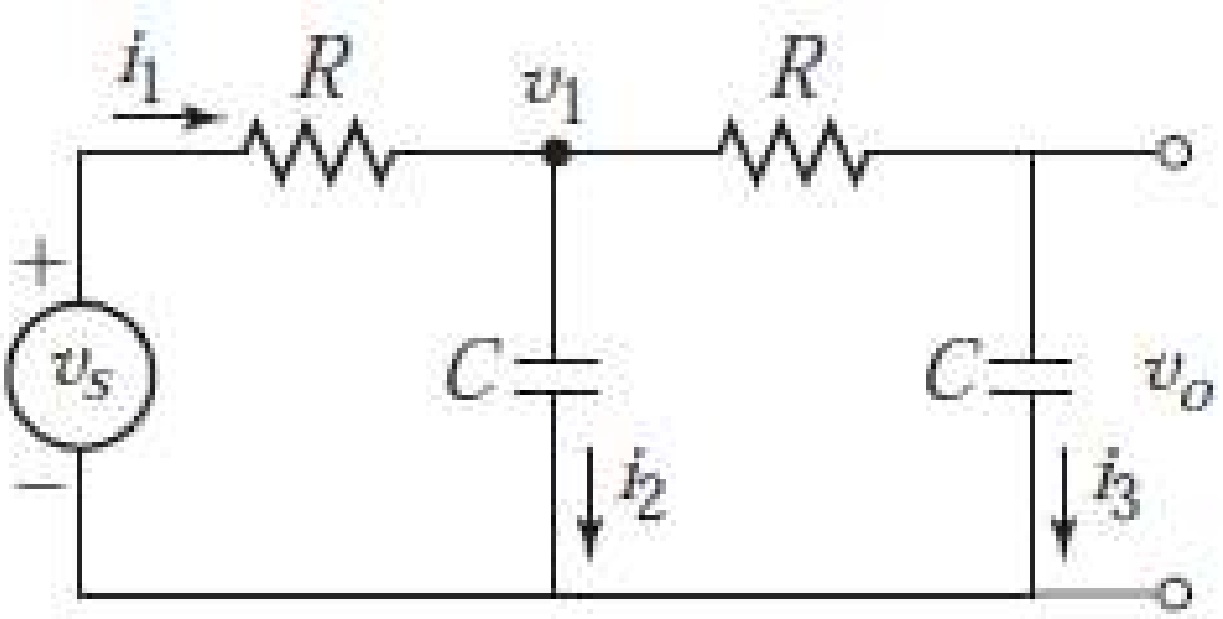
Visual expression of dynamics

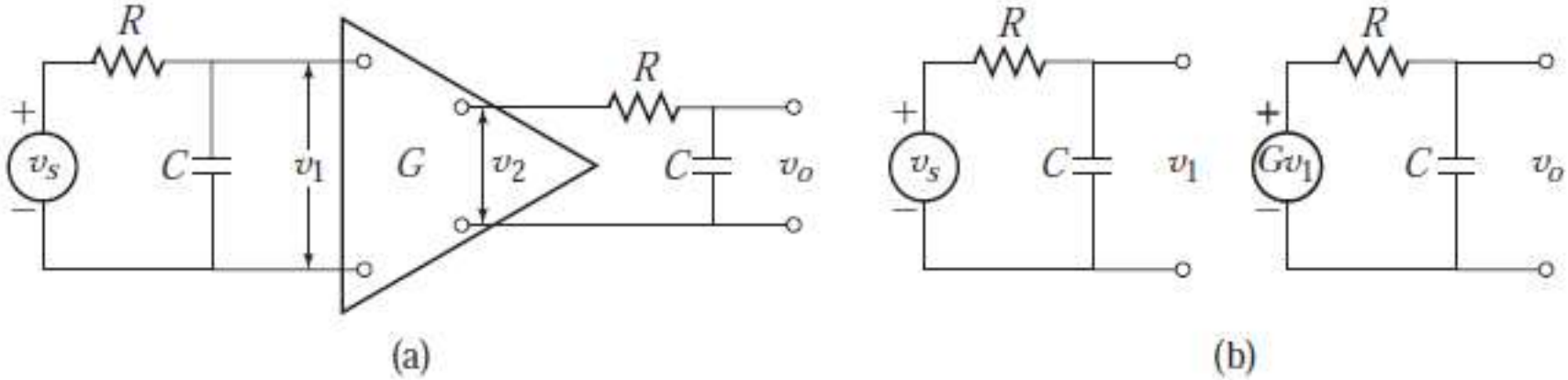
- Block diagram make it possible.
- Algebraic representation of the system equations in terms of transfer function
- Easier manipulation for analysis and desing
- Graphical representation is good for communication and understanding.

RC loops: coupled

- Draw block diagram for the circuit



RC loops: uncoupled



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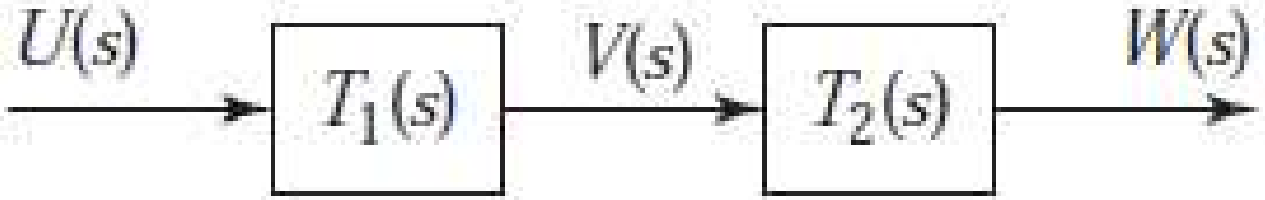
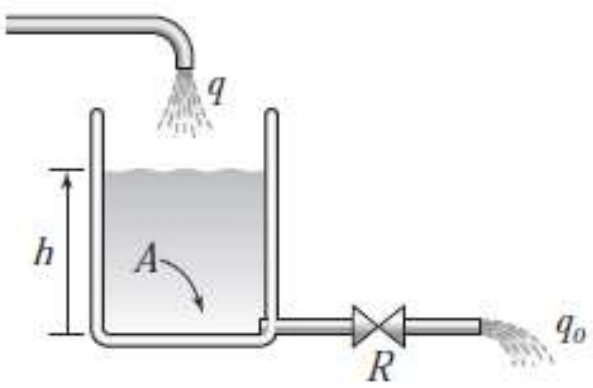
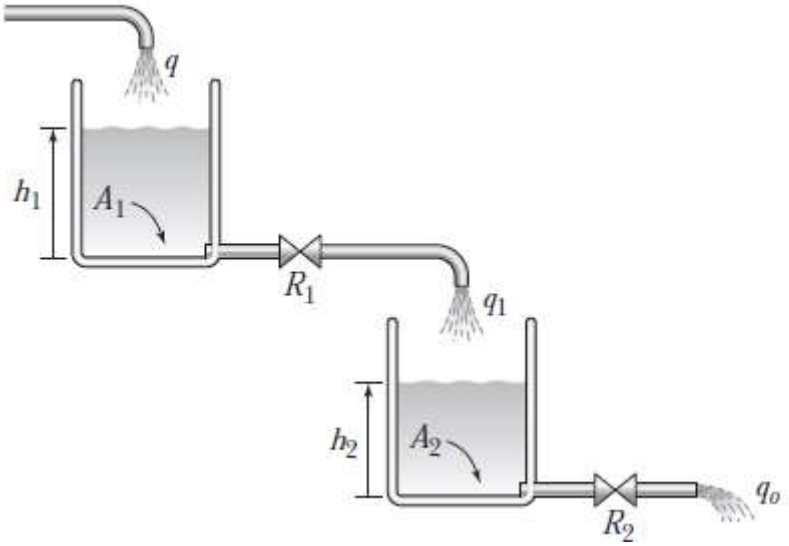


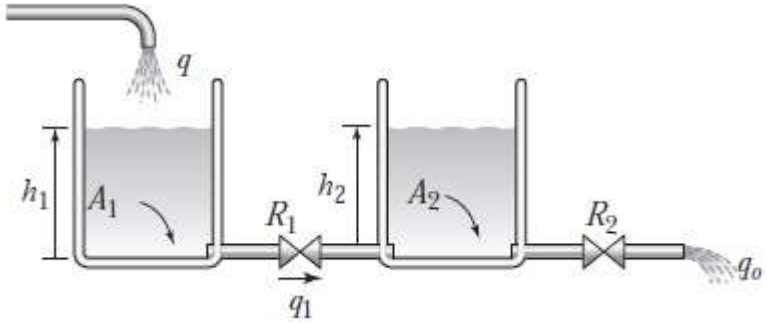
Armature-controlled motor

Field-controlled motor

Liquid-level system







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9.6 Matlab application

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Computing response characteristic with matlab

- Step(sys)
- Impulse(sys)

Block diagram algebra using matlab

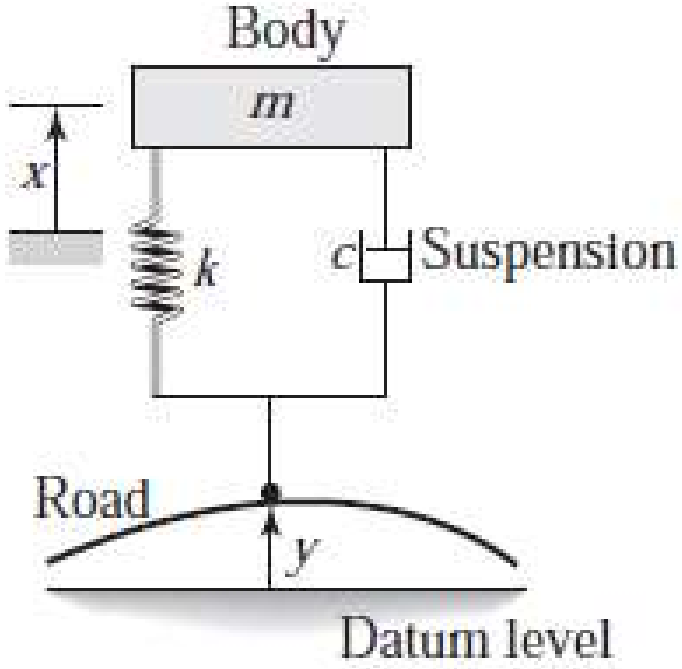
- Series(sys1,sys2)
- Feedback(sys1,sys2)

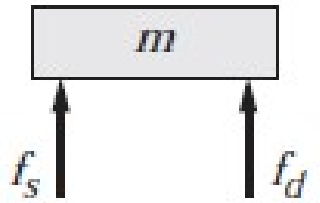
Simulink applications

- Linear and linearized model are useful for predicting the behavior of dynamic systems. WHY
- But input is not always step, impulse or periodical signals. Normally we want to test more.
- Simulink is good at for that. Most import: it is block diagram-based.

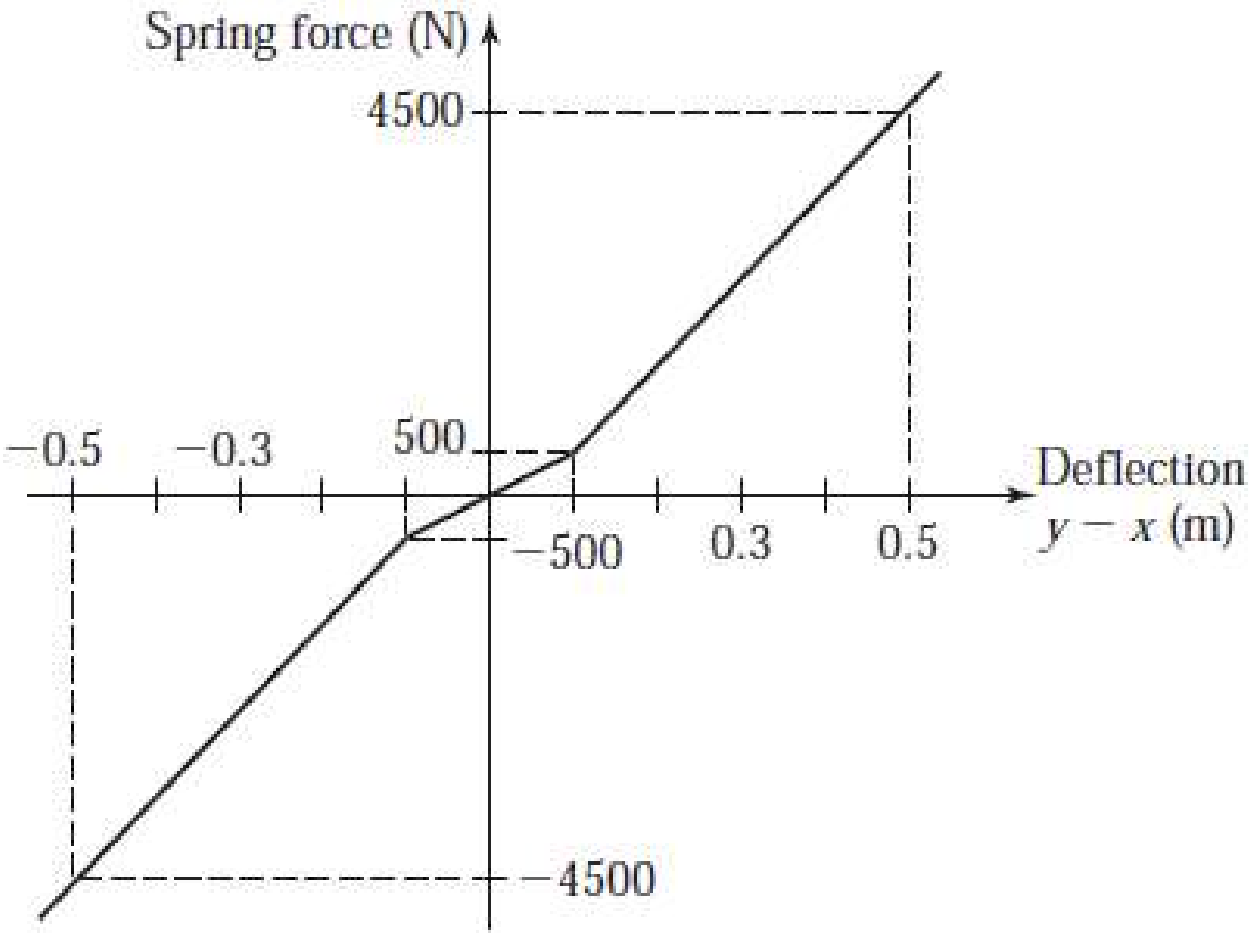
Hands-on exercise: vehicle suspension response

- m=400kg
- k and c is nonlinear
- Bump is trapezoidal function

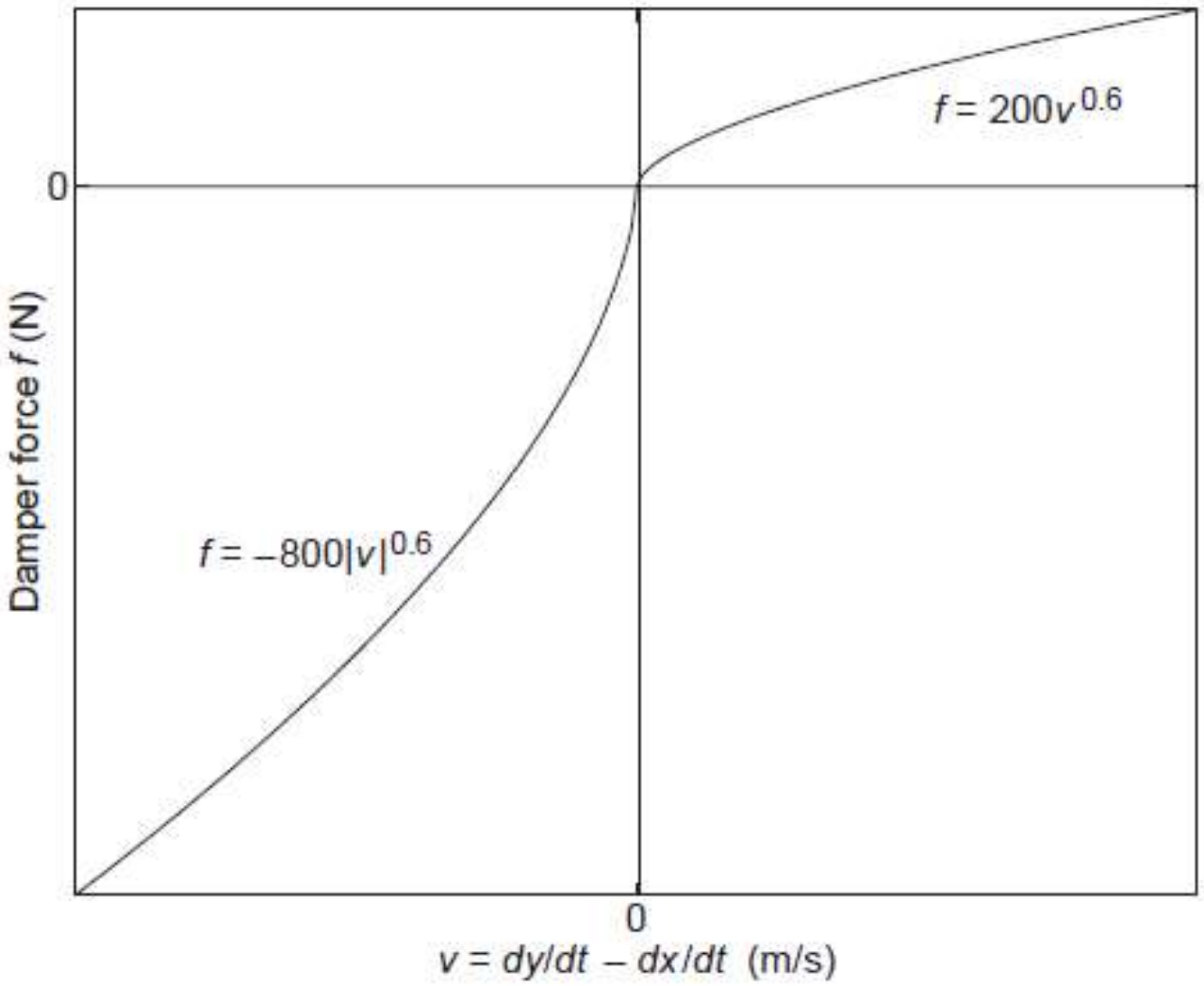




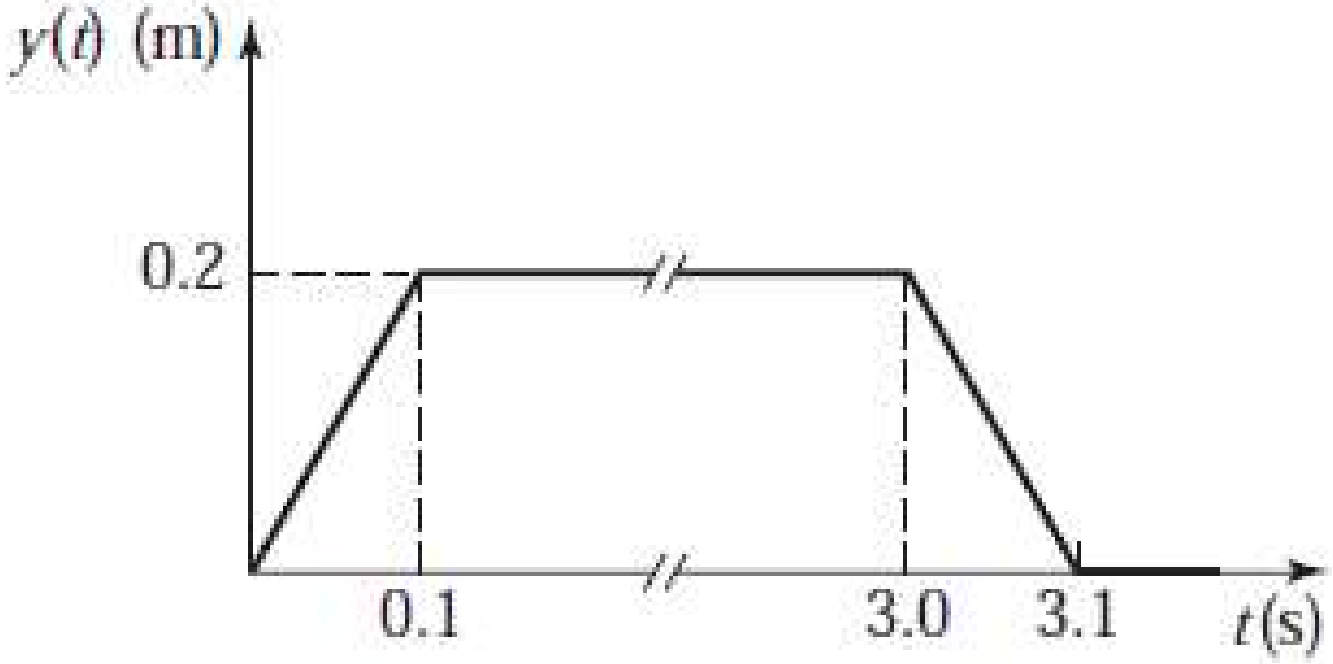
Spring characteristic



Damping characteristic



Bump profile



Hands-on

- Dynamic equations
- Block diagram
- Simulink modeling

- HW: 9.7,9.13,9.27,9.31,9.33,9.48,9.51,9.57

What we learned.

- Chapter 1
- Chapter 3
- Chapter 4
- Chapter 5
- Chapter 6
- Chapter 8
- Chapter 9

+ 9 HW + 2 LAB