CONTROL I

ELEN3016

Block Diagram Algebra

(Lecture 7)

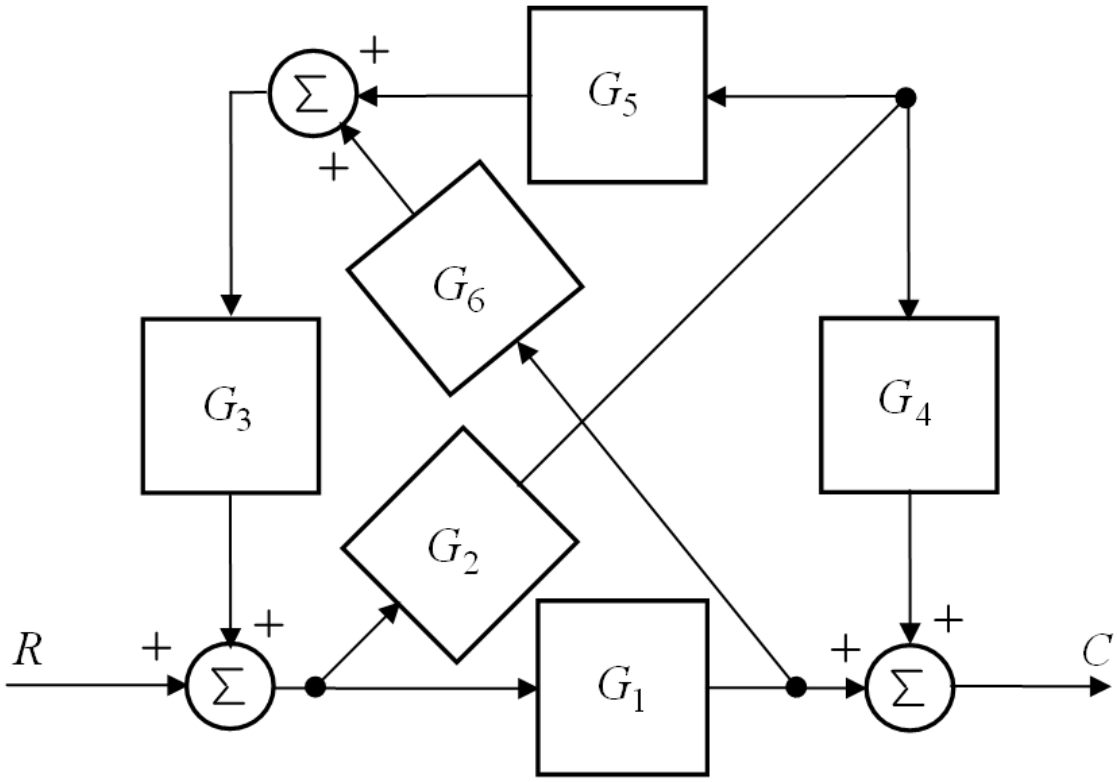
Overview

- Additional Example of Block Diagram Algebra/ Manipulation
- Homework Exercises & Tutorial

- Next Attraction!

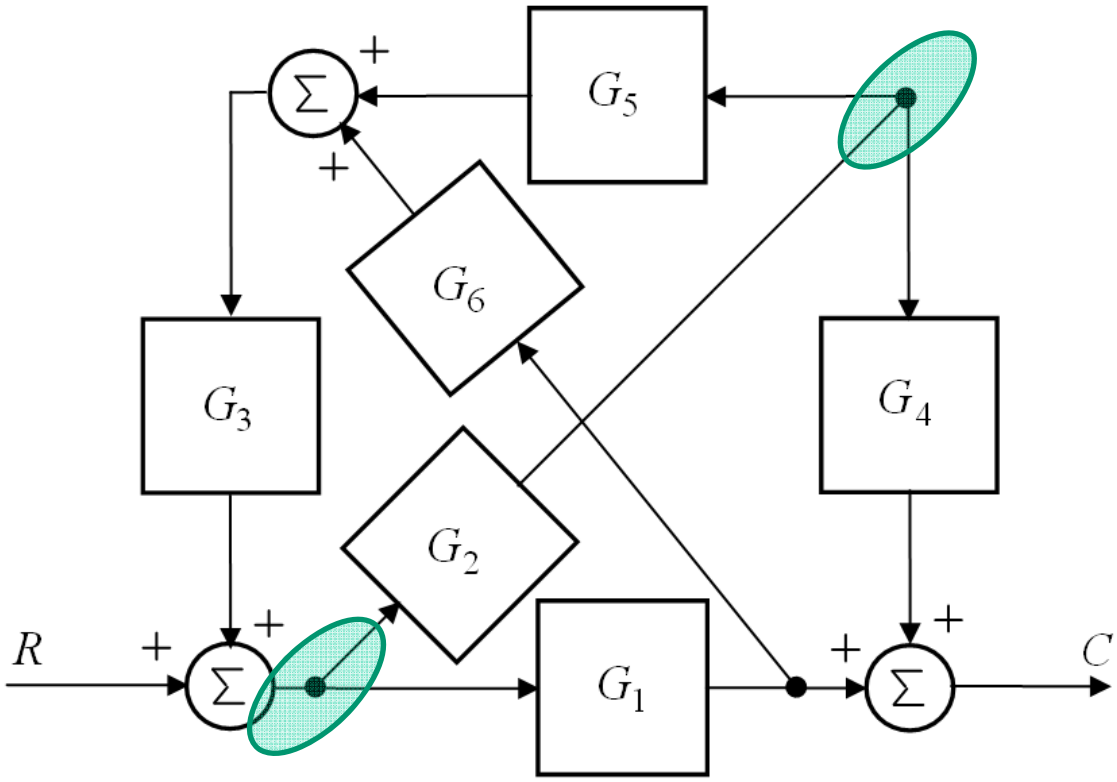
Block Diagram Algebra

Example



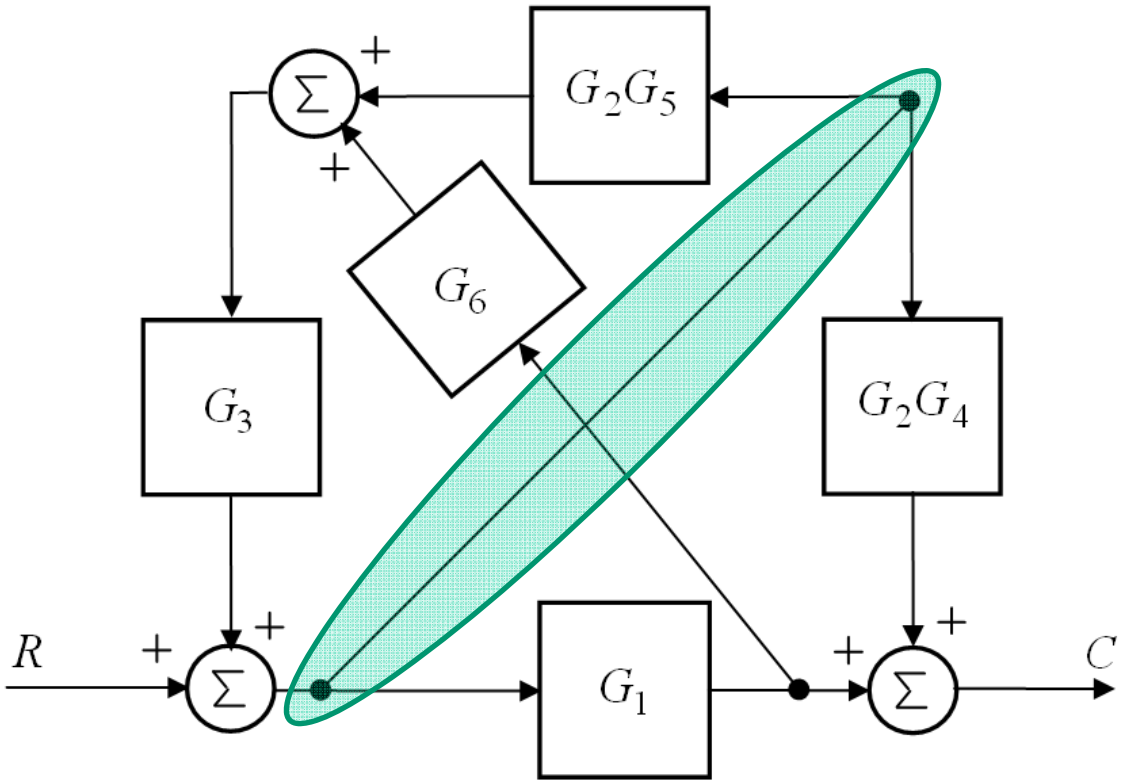
Block Diagram Algebra

Moving G_2 forward into the two branches enables us to combine the two nodes indicated.



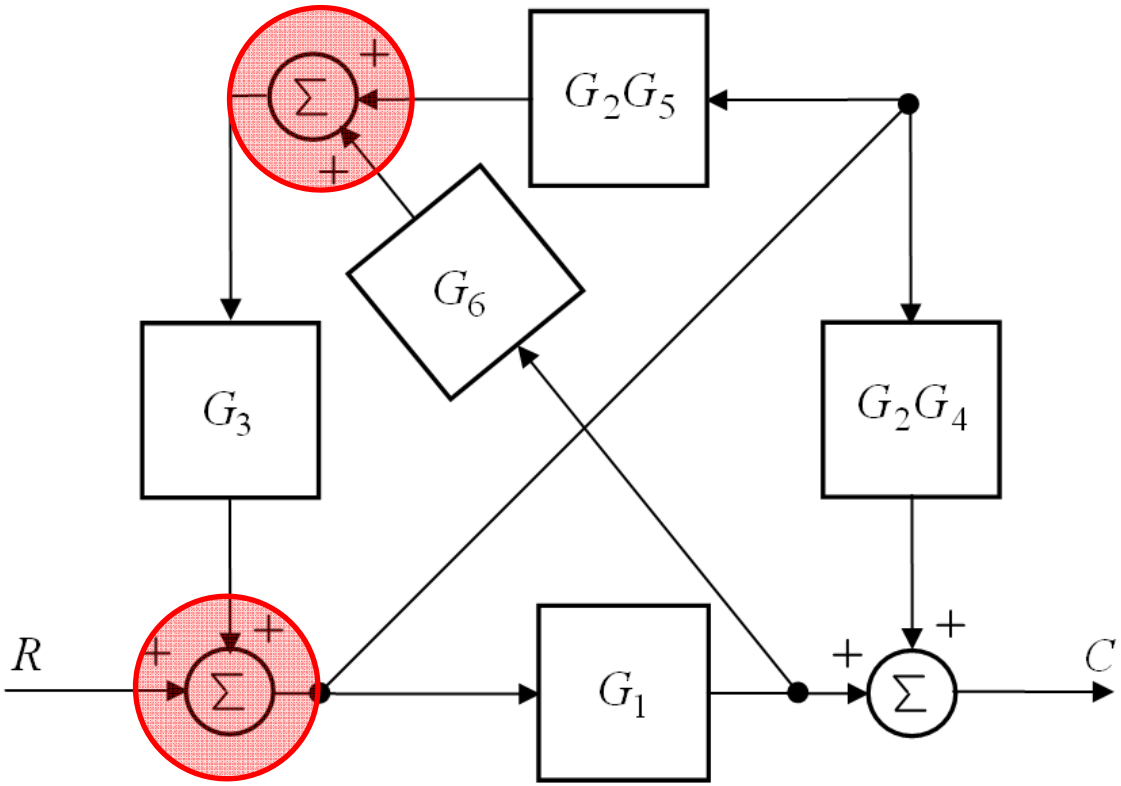
Block Diagram Algebra

G_2 has been moved forward into the two branches enabling us to combine the two nodes indicated.



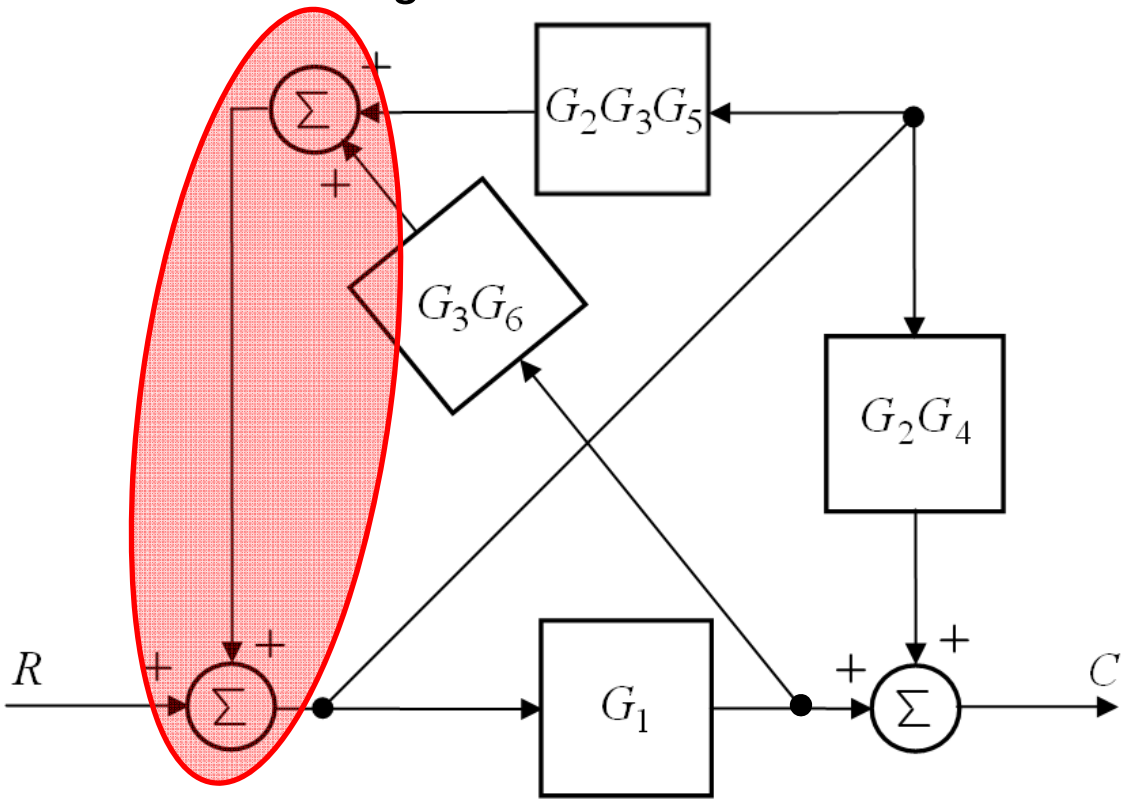
Block Diagram Algebra

Moving G_3 backward into the two branches enables us to combine the two summing nodes indicated.



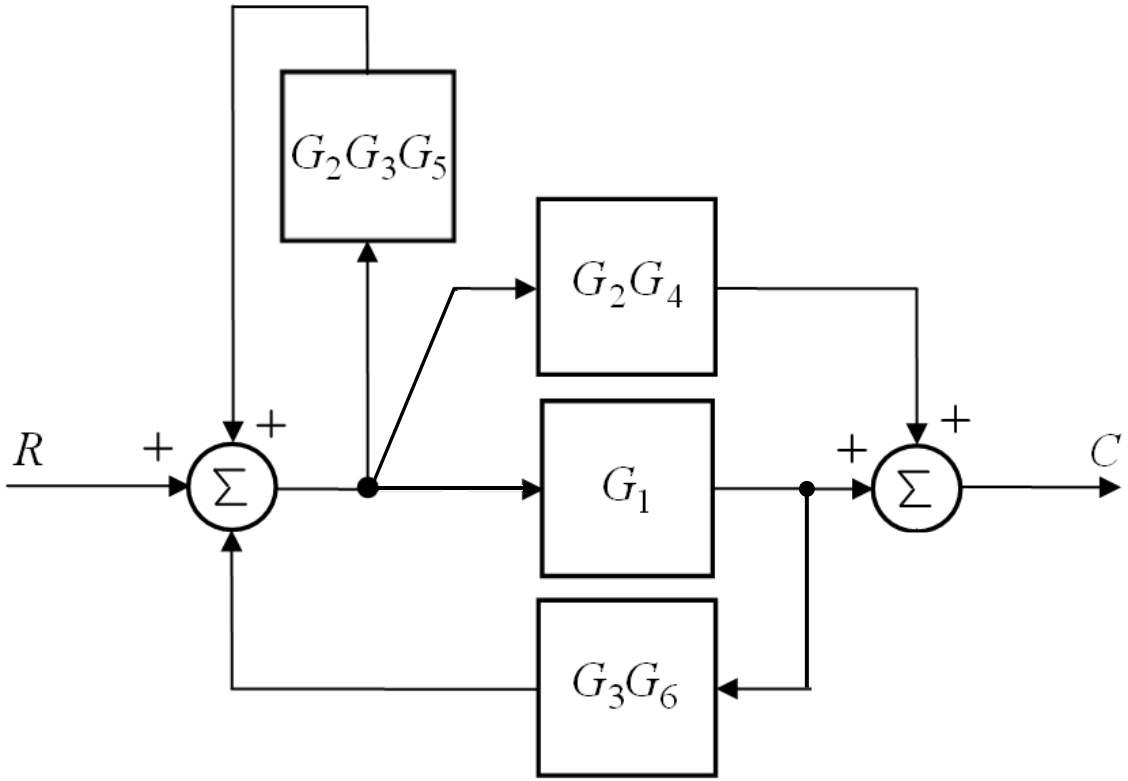
Block Diagram Algebra

G_3 has been moved backward into the two branches enabling us to combine the two summing nodes indicated.



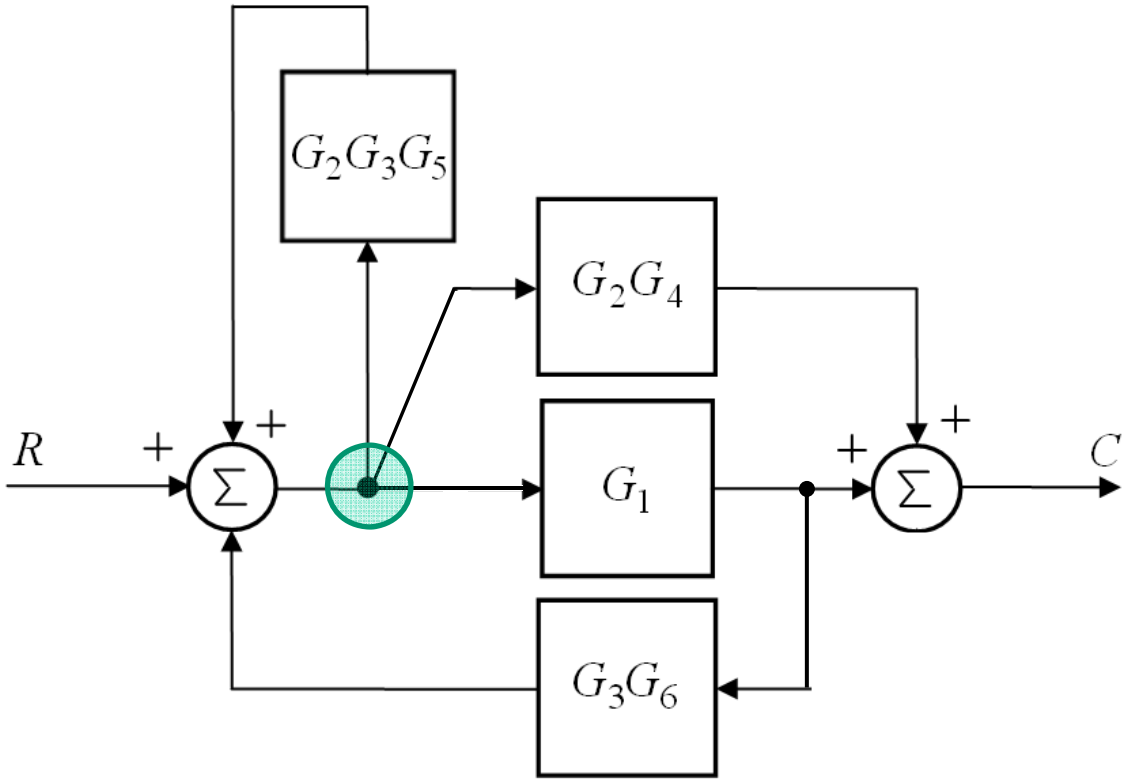
Block Diagram Algebra

The resulting block diagram is shown below.



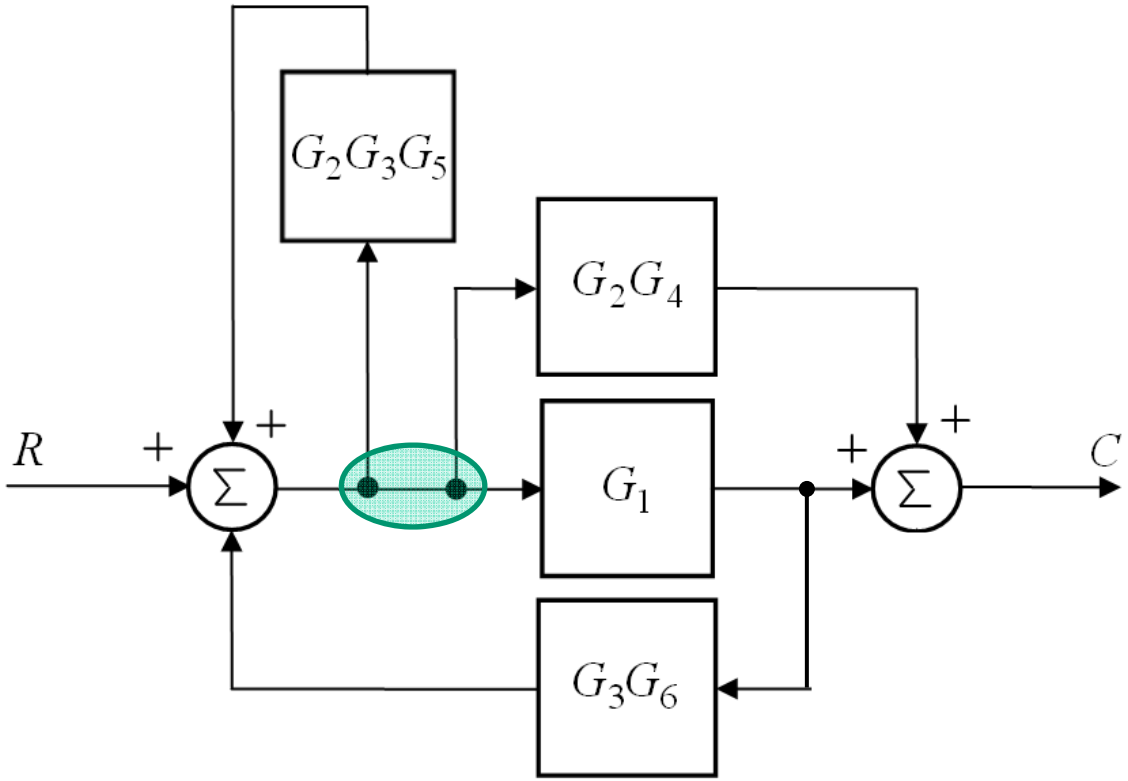
Block Diagram Algebra

The resulting block diagram is shown below.



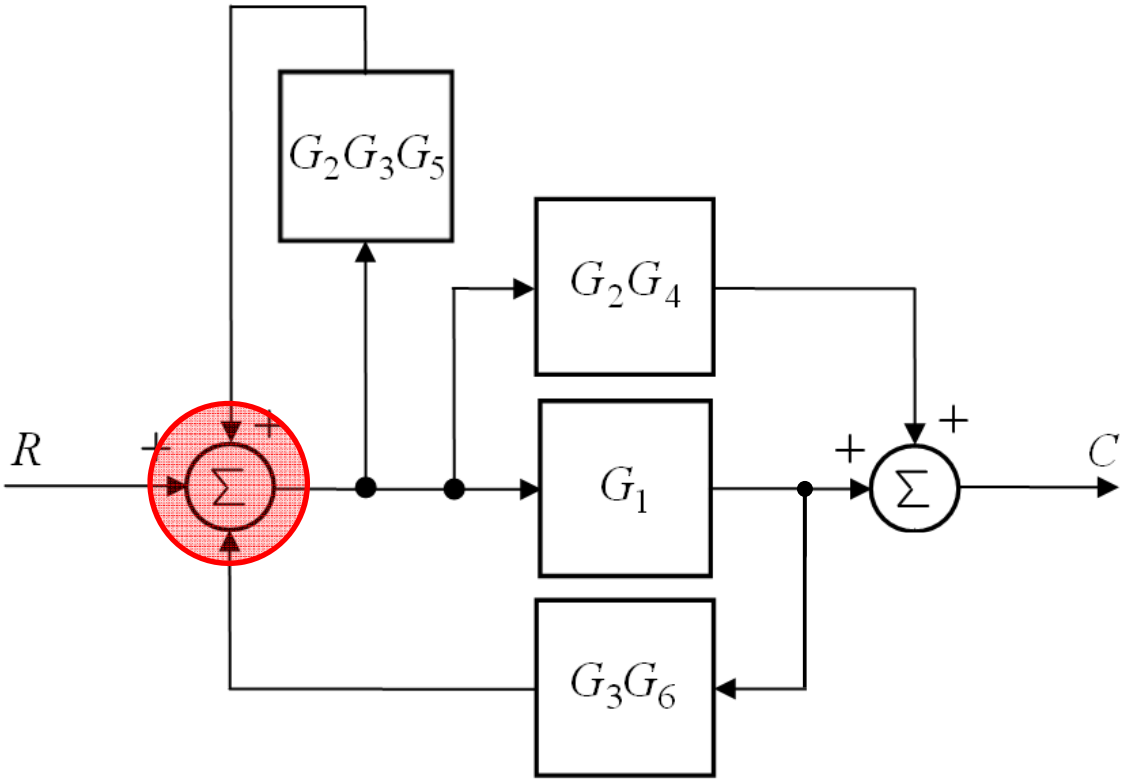
Block Diagram Algebra

The resulting block diagram is shown below.



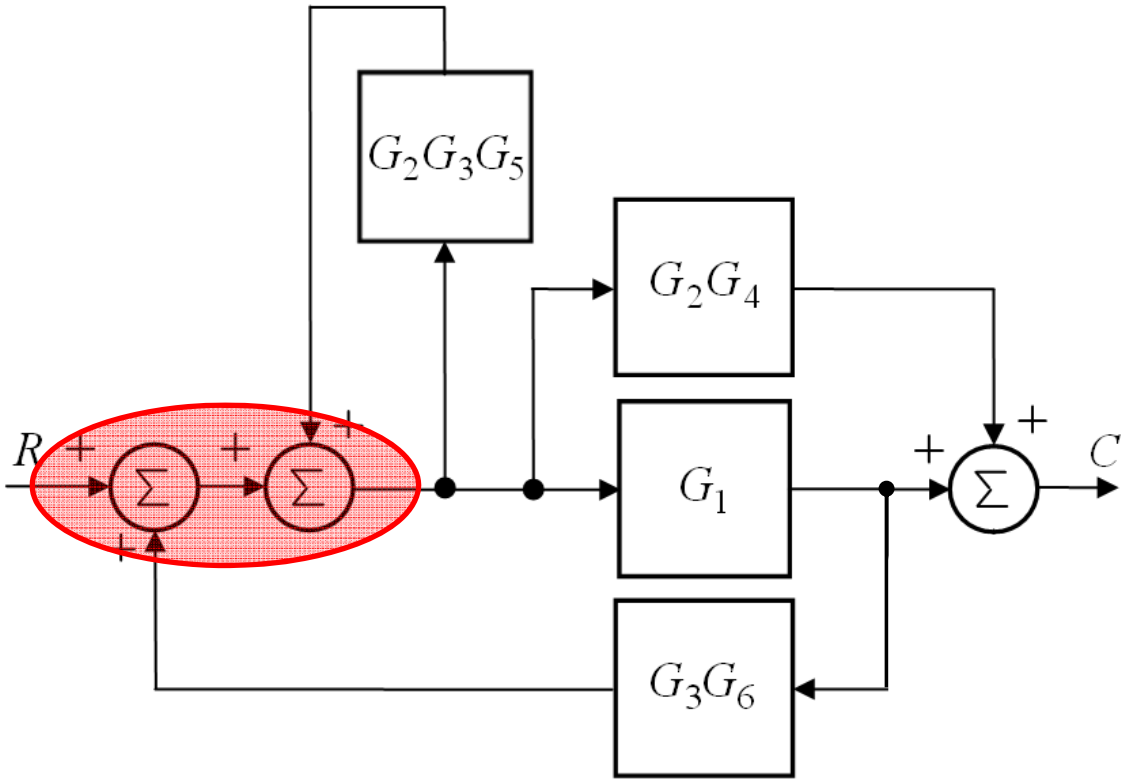
Block Diagram Algebra

Now consider the summing point indicated below. We need to split it.



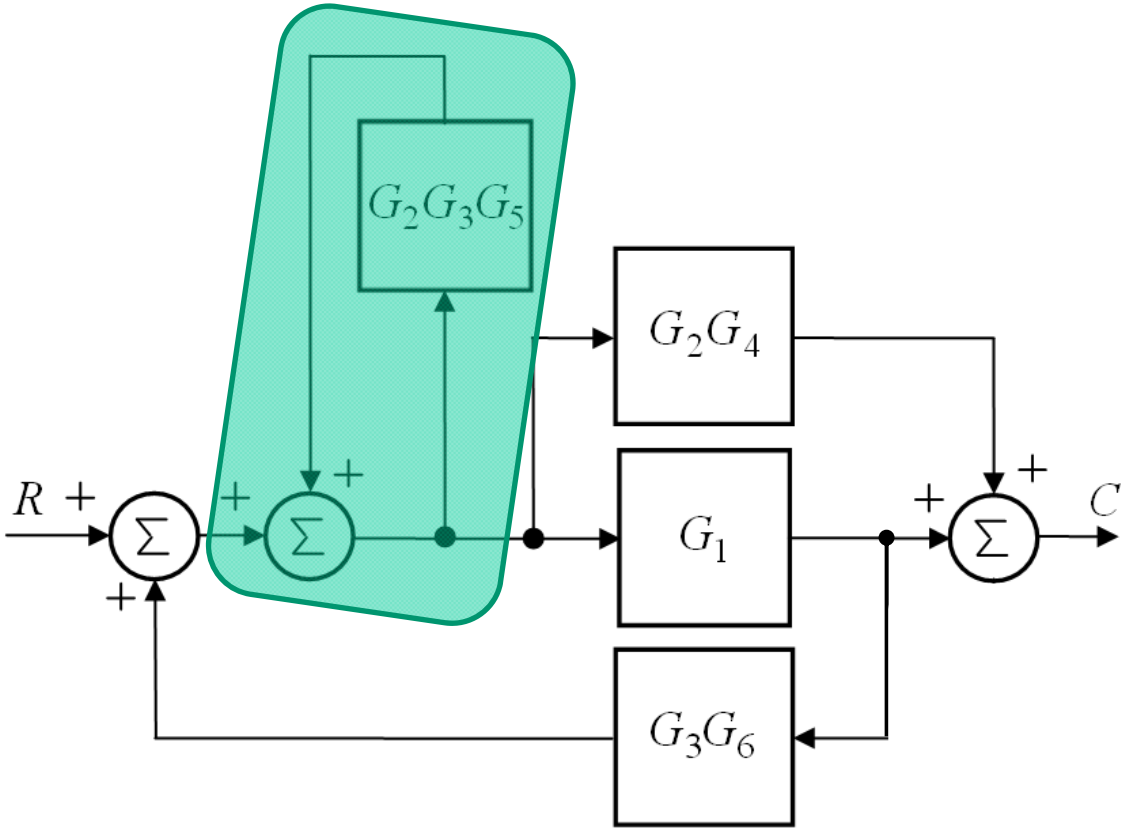
Block Diagram Algebra

Splitting the summing point we obtain the following result.



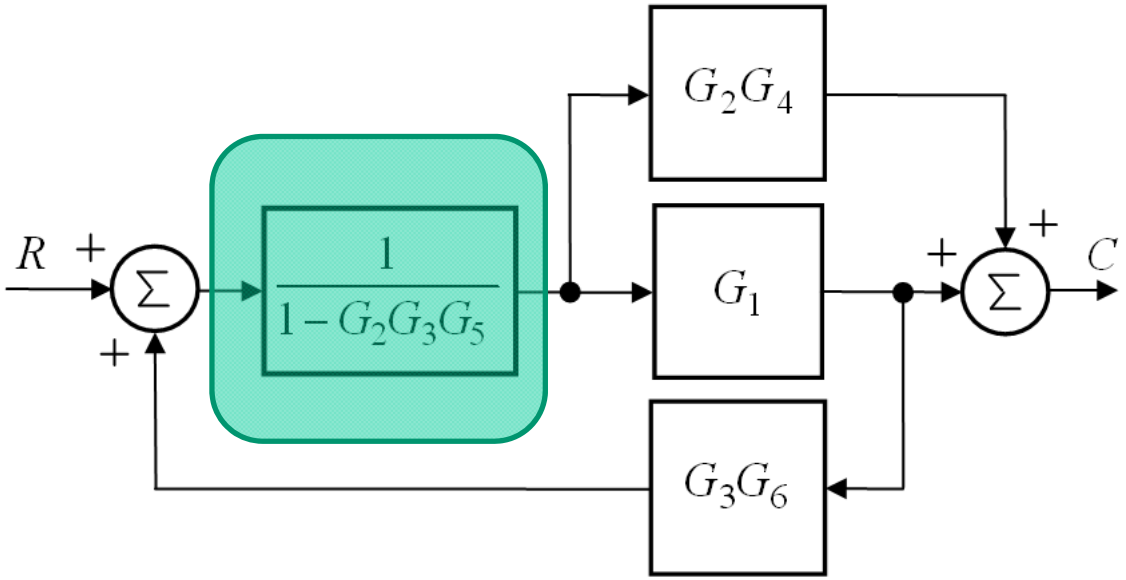
Block Diagram Algebra

We recognize the indicated block as being in standard feedback form.



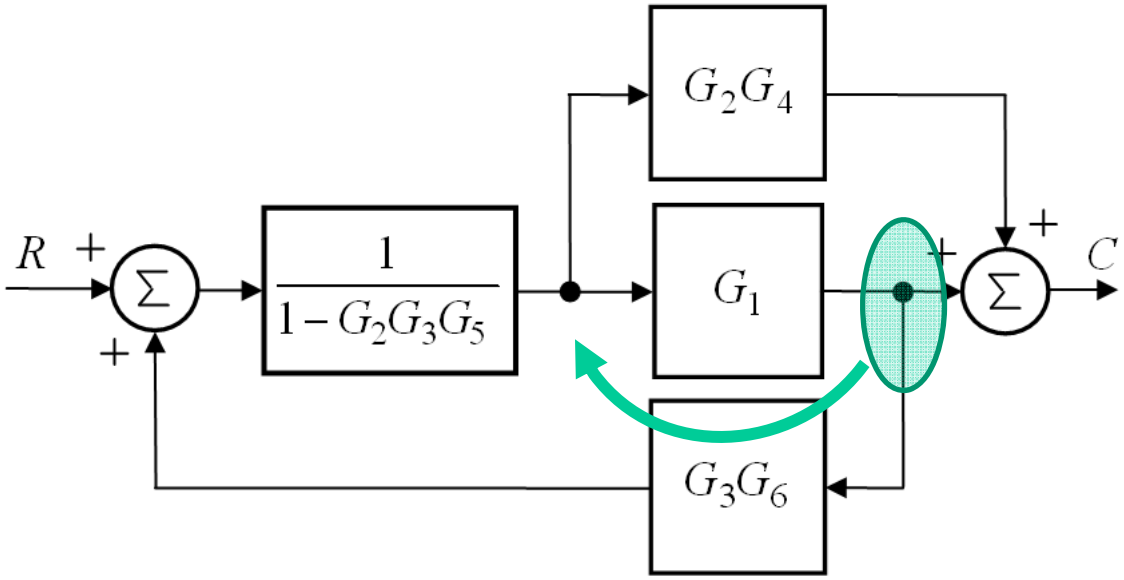
Block Diagram Algebra

Simplifying this block we obtain the following result.



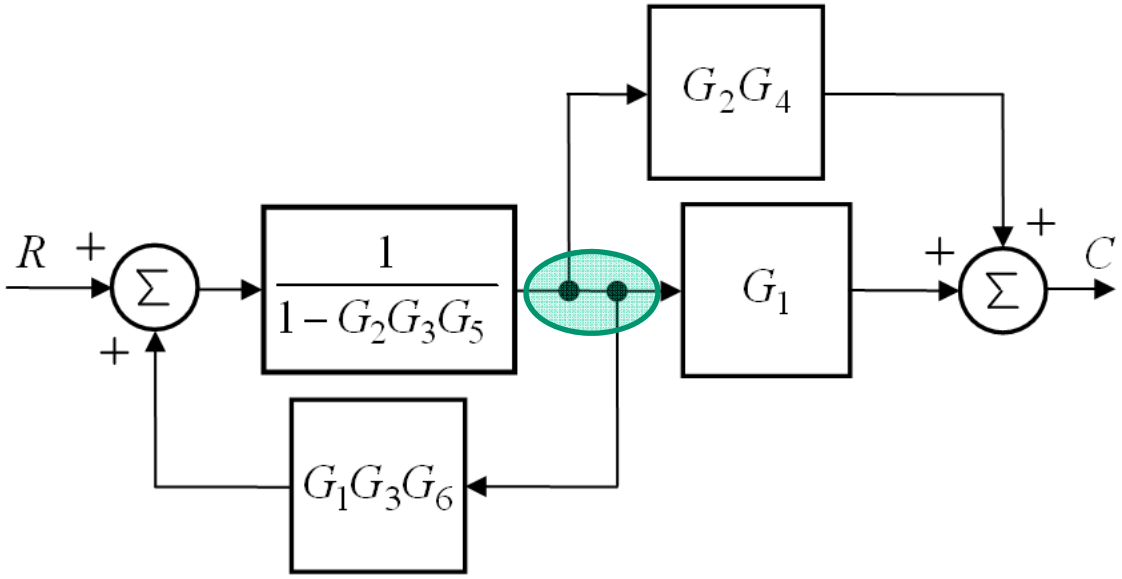
Block Diagram Algebra

Next, we wish to move the pickoff point backwards as indicated.



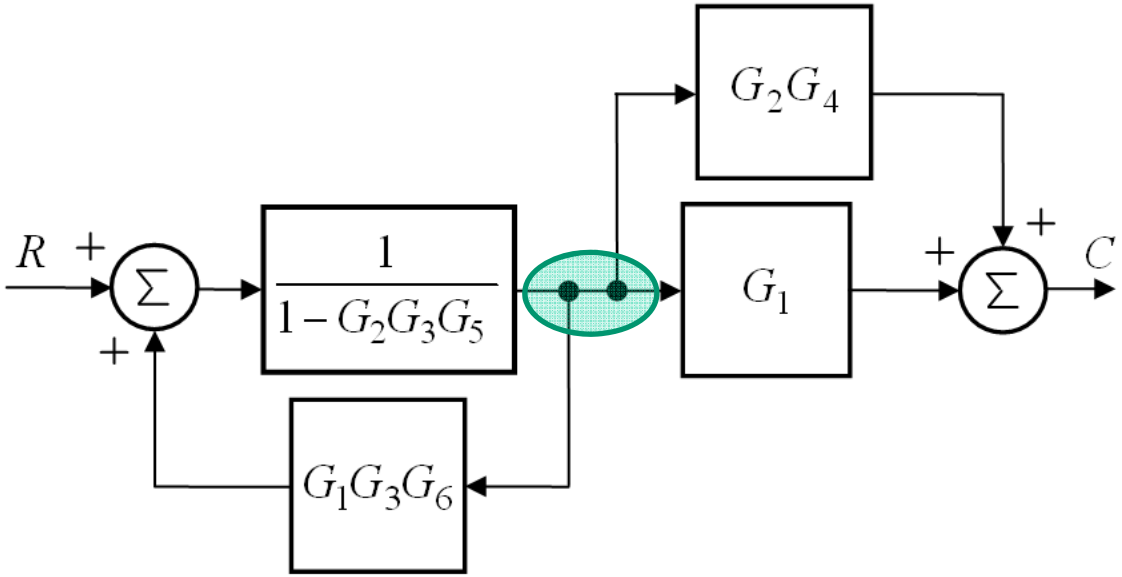
Block Diagram Algebra

Next, we are going to swap the order of the indicated nodes.



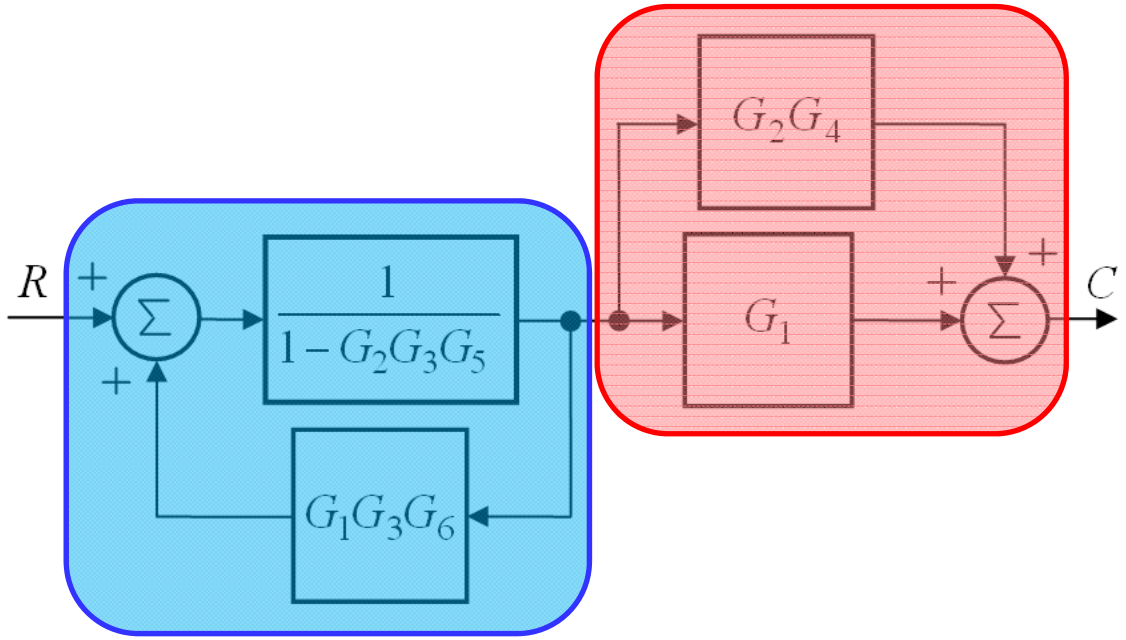
Block Diagram Algebra

The result is as shown below.



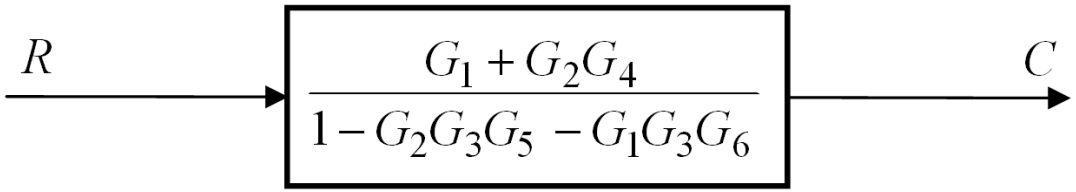
Block Diagram Algebra

Notice that the block on the left is in standard feedback form and the block on the right comprises two parallel system blocks.



Block Diagram Algebra

Finally the complete transfer function obtained is shown below.



Tutorial Exercises & Homework

- Tutorial Exercises
  - Solve the above example by moving blocks/nodes (where possible) in the opposite directions to that used there.
- Homework
  - Examples in Burns not covered in class.

Conclusion

- Closed-Loop Systems
- Block Diagram Manipulation
- Some Examples
- Superposition (Self-study!)
- Examples not covered (Self-study!)
- Tutorial Exercises & Homework

Next Attraction! – Miss It & You'll Miss Out!

- PID Control
- Case Study

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Thank you!

Any Questions?