# Control Systems

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***Abstract*—The objective of this manual is to introduce control system design at an elementary level.**

Download python codes using

```
svn co https://github.com/gadepall/school/trunk/
    control/codes
```

## 1 Feedback Circuits

1.0.1. For a particular amplifier connected in a feedback loop in which the output voltage is sampled,measurement of the output resistance before and after the loop is connected shows a change by a factor of 100.Is the resistance with feedback higher or lower?What is the value of the loop gain GH? If $R_{of}$ is 100 Ω ,what is $R_o$ without feedback.

**Solution:** We know that,

$$R_o = R_{of}(1 + GH) \tag{1.0.1.1}$$

Output resistance before and after the loop is connected changes bya factor 100.So,

$$100 = 1 + GH \tag{1.0.1.2}$$

$$GH = 99 \tag{1.0.1.3}$$

Open loop gain GH is 99.
Given,

$$R_{of} = 100 \tag{1.0.1.4}$$

$$R_o = 100(1 + 99) \tag{1.0.1.5}$$

$$R_o = 10000 \tag{1.0.1.6}$$

Output resistance without feedback is 10kΩ
Output resistance without feedback is greater than with feedback.
The following code generates the values

codes/ee18btech11042.py

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