

# Transient Response of Circuits

**Spoken Tutorial Project**

**<http://spoken-tutorial.org>**

**National Mission on Education through ICT**

**<http://sakshat.ac.in>**

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IIT Bombay**

**4 November 2015**

# Learning Objectives



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**We will study:**



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- **Transient response of :**  
RC, RL and LCR Circuits





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- **Under damped discharge of LCR circuit**



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**We will study:**

- **Transient response of :**  
RC, RL and LCR Circuits
- **Under damped discharge of LCR circuit**
- **RC Integration & Differentiation**



# System Requirement

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- **ExpEYES v 3.1.0**



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- **ExpEYES v 3.1.0**
- **Ubuntu Linux OS v 14.10**



# Pre-requisites



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- **ExpEYES Junior interface**



# Pre-requisites

- **ExpEYES Junior** interface
- For relevant tutorials, visit our website  
[www.spoken-tutorial.org](http://www.spoken-tutorial.org)





# Transient Response



# Transient Response

- *Transient response, is how a circuit responds to stored energy in capacitors or inductors*



# Transient Response

- *Transient response*, is how a circuit responds to stored energy in capacitors or inductors
- *Stored energy in a capacitor or an inductor, can be dissipated by a resistor*



# Transient Response of RC



# Transient Response of RC

- **Demonstrate transient response of RC circuit**



# Transient Response of RC



# Transient Response of RC

- Plot Step up and Step down voltage curves of RC circuit



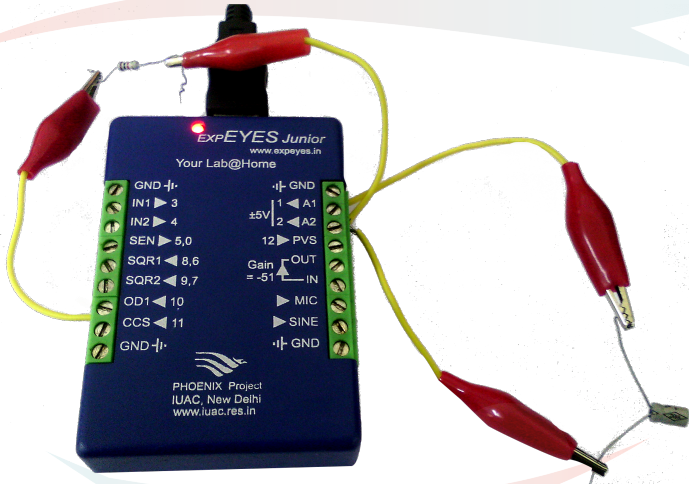
# Transient Response of RC

- Plot Step up and Step down voltage curves of RC circuit
- Measure RC in milli seconds

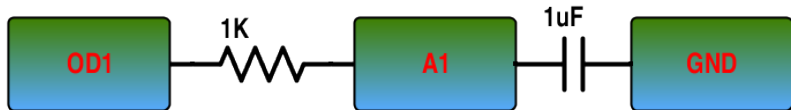




# Transient Response of RC



# Transient Response of RC



# Charging of capacitor

# Charging of capacitor

- **Charging of capacitor with constant current**

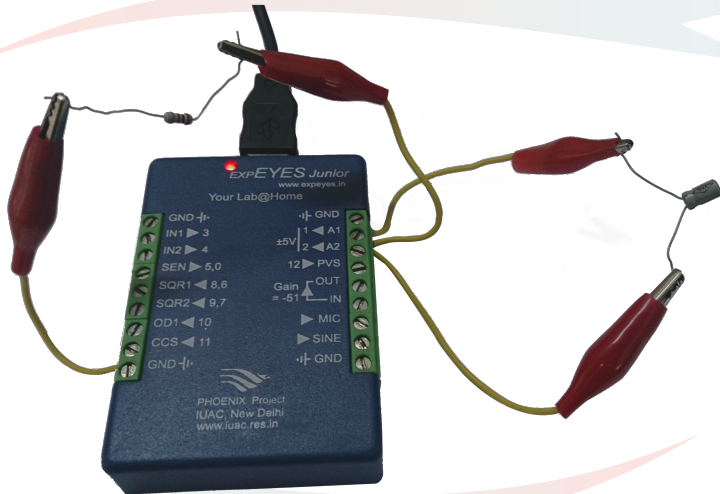


# Charging of capacitor

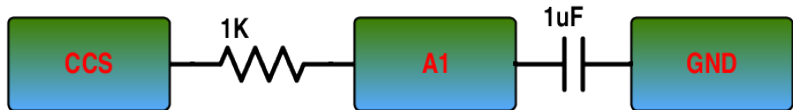
- Charging of capacitor with constant current
- Measure RC in milli seconds



# Charging of capacitor



# Charging of capacitor



# Transient Response of RL





# Transient Response of RL

- **Demonstrate transient response of RL circuit**



# Transient Response of RL



# Transient Response of RL

- Plot Step up and Step down voltage curves of RL circuit



# Transient Response of RL

- Plot Step up and Step down voltage curves of RL circuit
- Measure  $R/L$





# Transient Response of RL



# Assignment

- 1 Plot voltage curves of RL circuit using two coils connected in series



# LCR Circuit

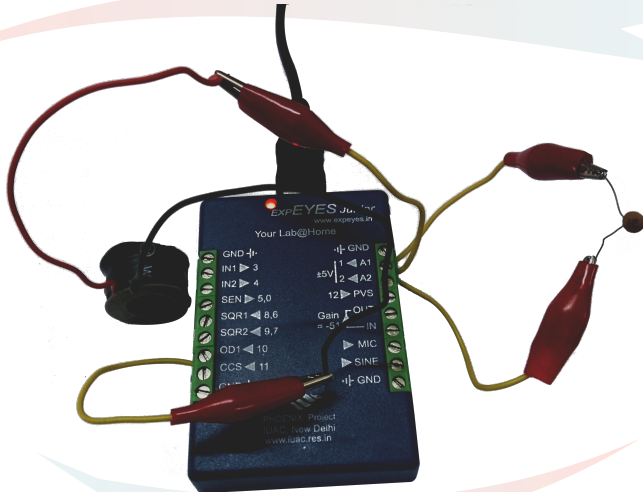


# LCR Circuit

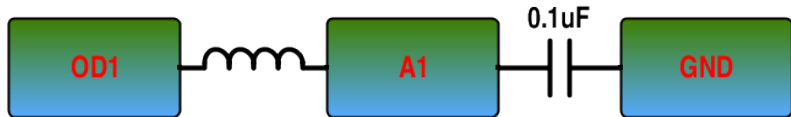
- **Show under damped discharge of LCR circuit**



# Transient Response of LCR



# Transient Response of LCR



# Assignment

- 1 Plot over damped discharge of LCR circuit using 2K resistor



# Assignment



# RC Integration



# RC Integration

- **Demonstrate RC integration**



# RC Integration



# RC Integration

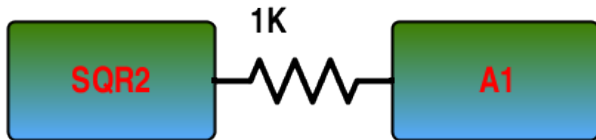
- **Transform a square wave to a triangular wave**



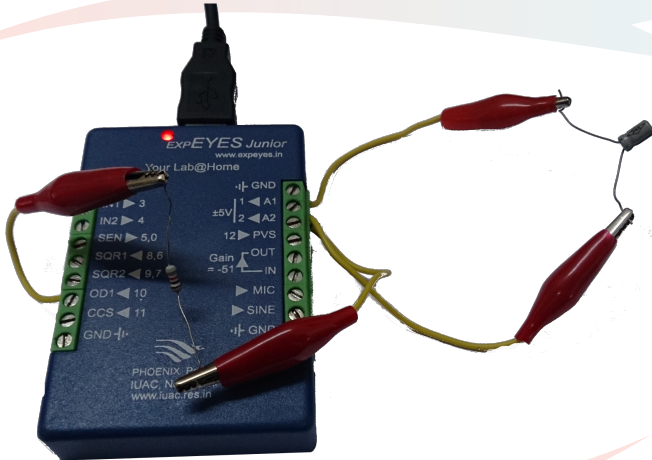
# RC Integration



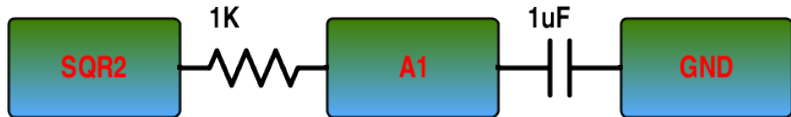
# RC Integration



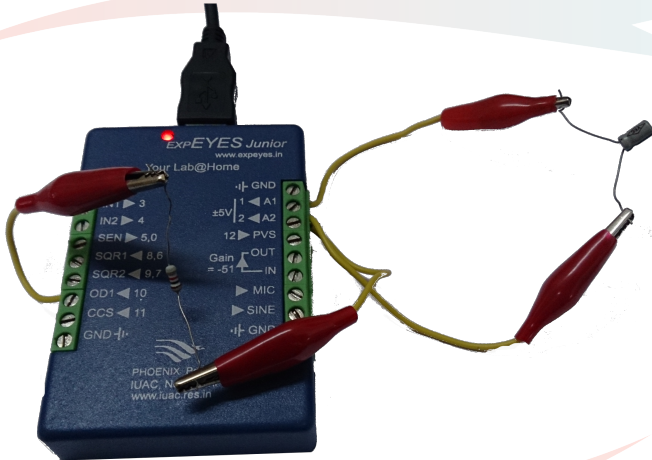
# RC Integration



# RC Integration



# RC Integration



# RC Differentiation

# RC Differentiation

- **Demonstrate RC differentiation**





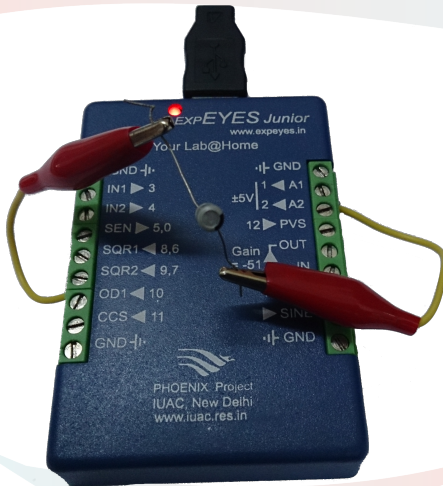
# RC Differentiation

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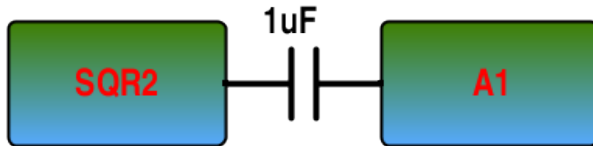
- **Transform a square wave to a narrow spikes wave**



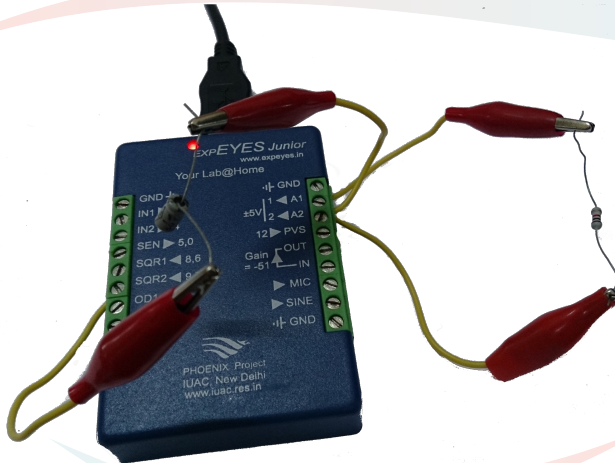
# RC Differentiation



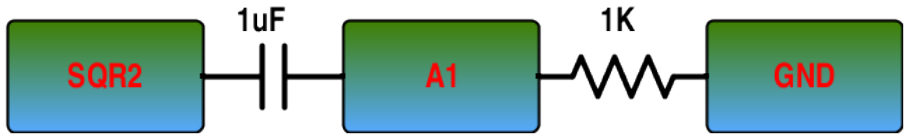
# RC Differentiation



# RC Differentiation



# RC Differentiation



# Summary

**We have studied,**

- **Transient response of RC, RL and LCR circuits**
- **Under damped discharge of LCR circuit**
- **RC integration & differentiation**



# About the Spoken Tutorial Project

- Watch the video available at [http://spoken-tutorial.org/What\\_is\\_a\\_Spoken\\_Tutorial](http://spoken-tutorial.org/What_is_a_Spoken_Tutorial)
- It summarises the Spoken Tutorial project





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- It summarises the Spoken Tutorial project
- If you do not have good bandwidth, you can download and watch it



# Spoken Tutorial Workshops

## The Spoken Tutorial Project Team

- Conducts workshops using spoken tutorials
- Gives certificates to those who pass an online test
- For more details, please write to [contact@spoken-tutorial.org](mailto:contact@spoken-tutorial.org)



# Acknowledgements

- Spoken Tutorial Project is a part of the Talk to a Teacher project
- It is supported by the National Mission on Education through ICT, MHRD, Government of India
- More information on this Mission is available at <http://spoken-tutorial.org/NMEICT-Intro>

