# First Order Response

## Passive Components Review

|  |  |
| --- | --- |
| Inductor | Capacitor |
|  |  |
| + Parallel inductors: | + Parallel capacitors: |
|  |  |
| + Series inductors: | + Series capacitors: |
|  |  |
| + Inductance | + Capacitance |
|  |  |

## Natural Response

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| --- | --- | --- |
|  | **Natural response** | |
| Circuit | 0237 | 0243 |
| Time Constant |  |  |
| Response |  |  |
| Power |  |  |
| Energy |  |  |
| Total Energy |  |  |

## Step Response

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| --- | --- | --- |
|  | **Step response** | |
| Circuit | 0247 | 0252 |
| Response |  |  |

# Second Order Response

## Classification

The classification of second order response is based on the characteristic equation as follows:

+ : Over-damped, there are two roots:

+ : Under-damped, the damped coefficient is given by

+ : Critically damped, the double root is:

## Parallel RLC

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| --- | --- | --- |
|  | **Parallel RLC** | |
| Characteristic Equation: | |
| Natural response | Step response |
| Over-damped |  |  |
| Under-damped |  |  |
| Critically damped |  |  |

## Series RLC

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| --- | --- | --- |
|  | **Series RLC** | |
| Characteristic Equation: | |
| Natural response | Step response |
| Over-damped |  |  |
| Under-damped |  |  |
| Critically damped |  |  |

# Laplace Transform

## Definition

If is continuous and there are positive numbers , such that, for all . Then is defined for all .

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## Properties

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## Formulas

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