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EC29201 Batch-5

Experiment number: 1

Aim: Familiarization with Circuit Components, Signal Generator and Oscilloscope

Summary

Resistor: A resistor is a passive 2 terminal electrical component which produces heat when current flows through it or in other words, it resists the flow of current through a circuit and dissipates energy. Resistors are color coded to identify the value of resistance associated with it. The unit of resistance is ohm (Ω).

V=I*R where I is current through resistor and V is potential applied across it.

The resistance may either be fixed or be variable. Carbon film resistor is the most commonly used resistor but they come to be electrically noisy. Metal film resistors carry higher tolerance. Example of a variable resistance device is potentiometer.

The colour coding consists usually of 4-5 bands which represent the digits, multiplier and tolerance value respectively.

Capacitor: A capacitor is passive 2 terminal electrical components like resistor also known as condenser. It is a charge storing element in the form of electric field. It is made of two parallel metal plates separated by some insulating material also called dielectric. Capacitors are marked with a value called capacitance which means its electrical capacity and the unit is farads (F).

Q=C*V where Q is charge and V is applied voltage. The dynamic description involves the formula I=C*(dv/dt) where I is current flowing through capacitor.

There are broadly two types of capacitor, polarized and un-polarized. Polarized have a specific terminal to which the higher potential side must be connected whereas in un-polarized there are no such restriction.

There are different ways to read the capacitance of a capacitor based on its colour code or based on the value written on it. Some examples of capacitor include ceramic, electrolytic, tantalum capacitors etc.

Inductor: An inductor is a passive 2 terminal electrical component which stores energy in the form of magnetic field inside it when current is made to pass through it.

It is also known as a choke, coil or a reactor.

The mathematical equation which governs the working of an inductor is V=L*di/dt. It controls the rate of change of current according to the externally applied voltage.

The unit of inductance is Henry (H).

The amount of Inductance depends on (1) number of turns in the coil (2) cross section of the coil. (3) Material with which the coil is made up (4) Length of the coil

The formula for inductance being ((μ*(N^2)*A)/L) where terms have their usual meanings.

If they are connected in series, then net inductance is sum of individual inductance values and in parallel the reciprocal of net inductance is sum of reciprocal of individual inductance values. (Neglecting mutual inductance)

Oscilloscope: It is a device to display voltage waveform versus time and has the following features.

1. a screen to display a waveform,
2. input jacks for connecting the signal to be displayed,
3. Dials to control how the signal will be displayed.

There are two signals –an internally generate signal (called sweep signal) displayed along x-axis and the input signal which is also called a signal trace or trace along Y-axis creating a 2-dimensional time trace of input signal.

The screen is a cathode ray tube and the X-axis represents time while Y-axis represents voltage.

Signal generator: It is an electronic device which generates electronic signals with set properties of amplitude, frequency and wave shape. They are used as a stimulus for electronic measurements uses in testing.

Various types of signal generators are: function generator, RF and microwave signal generators, pitch generators, arbitrary waveform generators, digital pattern generators and frequency generators.

Familiarisation with Resistor



THEORY (#) QUIZ (#) REFERENCES (#)

Quiz

Color Code for Resistor

COLOR	DIGIT	MULTIPLIER	TOLERANCE %	COLOR BAND
Black	0	10^0 Ω		
Brown	1	10^1 Ω	1	
Red	2	10^2 Ω	2	
Orange	3	10^3 Ω (1 KΩ)		
Yellow	4	10^4 Ω (10KΩ)		
Green	5	10^5 Ω (100KΩ)	0.5	
Blue	6	10^6 Ω (1MΩ)	0.25	
Violet	7	10^7 Ω (10MΩ)	0.1	
Grey	8	10^8 Ω (100MΩ)	0.05	
White	9	10^9 Ω (1GΩ)		
Gold		10^{-1} Ω	5	

Silver		10^{-2} Ω	10	
None			20	

1.

Enter the resistance value: 47 KOhm

Enter the tolerance : +/- 5 %

Correct Resistance Value
Correct Unit Value
Correct Tolerance Value
check

2.

Enter the resistance value: 5.2 Ohm

Enter the tolerance : +/- 10 %

Correct Resistance Value
Correct Unit
Correct Tolerance Value
check

3.

Enter the resistance value: 97 Ohm

Enter the tolerance : +/- 20 %

Correct Resistance Value

Correct Unit
Correct Tolerance Value
check

4.

Enter the resistance value: 3.3 KOhm

Enter the tolerance : +/- 0.1 %

Correct Resistance Value
Correct Unit
Correct Tolerance Value
check

5.

Enter the resistance value: 1.58 Ohm

Enter the tolerance : +/- 2 %

Correct Resistance Value
Correct Unit
Correct Tolerance Value
check

6.

Enter the resistance value: 6.15 Ohm

Enter the tolerance : +/- 0.25 %

Correct Resistance Value
Correct Unit
Correct Tolerance Value

check

Familiarisation with Capacitor

THEORY (#) QUIZ (#) REFERENCES (#)

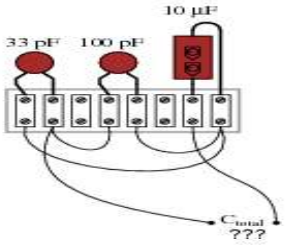
Quiz

Test Your Knowledge!!

✓ 1. Two 33 µF capacitors are connected in series with each other. What will their com in Farads?

- (•) 16.5 µF
- ( ) 120 µF
- ( ) 66 µF
- ( ) 200 µF

✓ 2. Calculate the total capacitance in this collection of capacitors, as measured betwe



Calculate total capacitance given the values of inductors C1, C2, and C3

- ( ) 130.990 pF
- ( ) 200.8 pF
- ( ) 130 pF
- (•) 132.998 pF

✓ 3. A 10μF capacitor is charged to a voltage of 20 volts.How many coulombs of elec in this capacitor?

- ○ 20μC of charge
- ○ 120μC of charge
- ○ 20mC of charge
- ◉ 200μC of charge

✓ 4. Two 470μF capacitors connected in series are subjected to a total applied volta rate of 200 volts per sec. How much current will there be through these capacitors? (Hint :The total voltage is divided evenly between the two capacitors.)

- ◉ 47 mA
- ○ 470 mA
- ○ 94 mA
- ○ 940 mA

✓ 5. Two capacitors 470μF capacitors connected in parallel are subjected to a total changes at a rate of 200 volts per sec.How much total current will there be through t

- ○ 47 mA
- ○ 18 mA
- ◉ 188 mA
- ○ 18.8 mA

Submit

Familiarisation with Inductor

THEORY (#) QUIZ (#) REFERENCES (#)

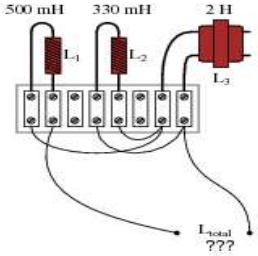
Quiz

Test Your Knowledge!!

✓ 1. . Two 50 mH inductors are connected in parallel with each other. What will their be in Henrys?

- ○ 200 mH
- ○ 50 mH
- ○ 100 mH
- ◉ 25 mH

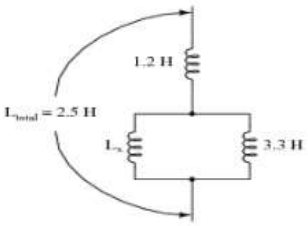
✓ 2. Calculate the total inductance in this collection of inductors, as measured betweer



calculates total inductance given the values of inductors L1, L2, and L3.

- ○ 700 mH
- ◉ 783.26 mH
- ○ 689.09 mH
- ○ 583.26 mH

✓ 3. How large must Inductor Lx be in order to provide a total inductance of 2.5 inductors?



- ○ 214.5 H
- ◉ 2.145 H
- ○ 1.245 H
- ○ 12.45 H

✓ 4. Two 5 H inductors connected in series are subjected to an electric current that ch amps per sec.How much voltage will be dropped across the series combination?

- ◉ 45 V
- ○ 22.5 V
- ○ 11.25 V
- ○ 90 V

✓ 5. Two 5 H inductors connected in parallel are subjected to an electric current that 4.5 amps per sec.How much voltage will be dropped across the series combina current is divided evenly between the two inductors).

- ○ 45 V
- ○ 22.5 V
- ◉ 11.25 V
- ○ 90 V

Submit

CONCLUSION

The experiment helped me in getting familiarized with the basic components of an electronic circuit. It helped me to understand the working principle and the mathematical equations governing the working of a capacitor, inductor and resistor. In addition, it also let me to know of the basic working of an oscilloscope and different types of function generators. Also it gave me a brief idea of a cathode ray tube screen. I came to know of the method to read the value of capacitance, inductance and resistance through the value written on them, especially on a capacitor which was new for me.The idea of inductive kick and un-polarized and polarized capacitor and their working was also a new learning for me.