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TASK -1

RESISTORS

- **Definition** : -A passive electrical component with two terminals that are used for either limiting or regulating the flow of electric current in electrical circuits.

- **Types** : -

1] Linear Resistors : -The resistors whose values change with change in applied temperature and voltage are known as linear resistors.

Two Types of Linear Resistors are Fixed & Variable . In fixed the value is fixed and for Variable value can be changed

a)Example of fixed resistors = Carbon composition resistors, Wire wound resistors, Thin film resistors, Thick film resistors

b) Example of Variable Resistors : - Potentiometer , Rheostats , Trimmers

2] Non- Linear Resistors : - The Resistance change according to the temperature and voltage applied and is not dependent on Ohm's Law.

- **Types** : - Thermistors , Varistors , Photo resistors
- **Applications** : - Resistors are mainly used to control the current flow

Following are the applications of Resistors,-

1] High Frequency instruments:

Resistors act as a combination of resistance ,inductance & high capacitance at high frequency .At high frequency , resistors are frequency dependent elements which is explained by skin effect . Resistors are used in high frequency instruments to access the timing source. Eg :- Light flashers , blinking light

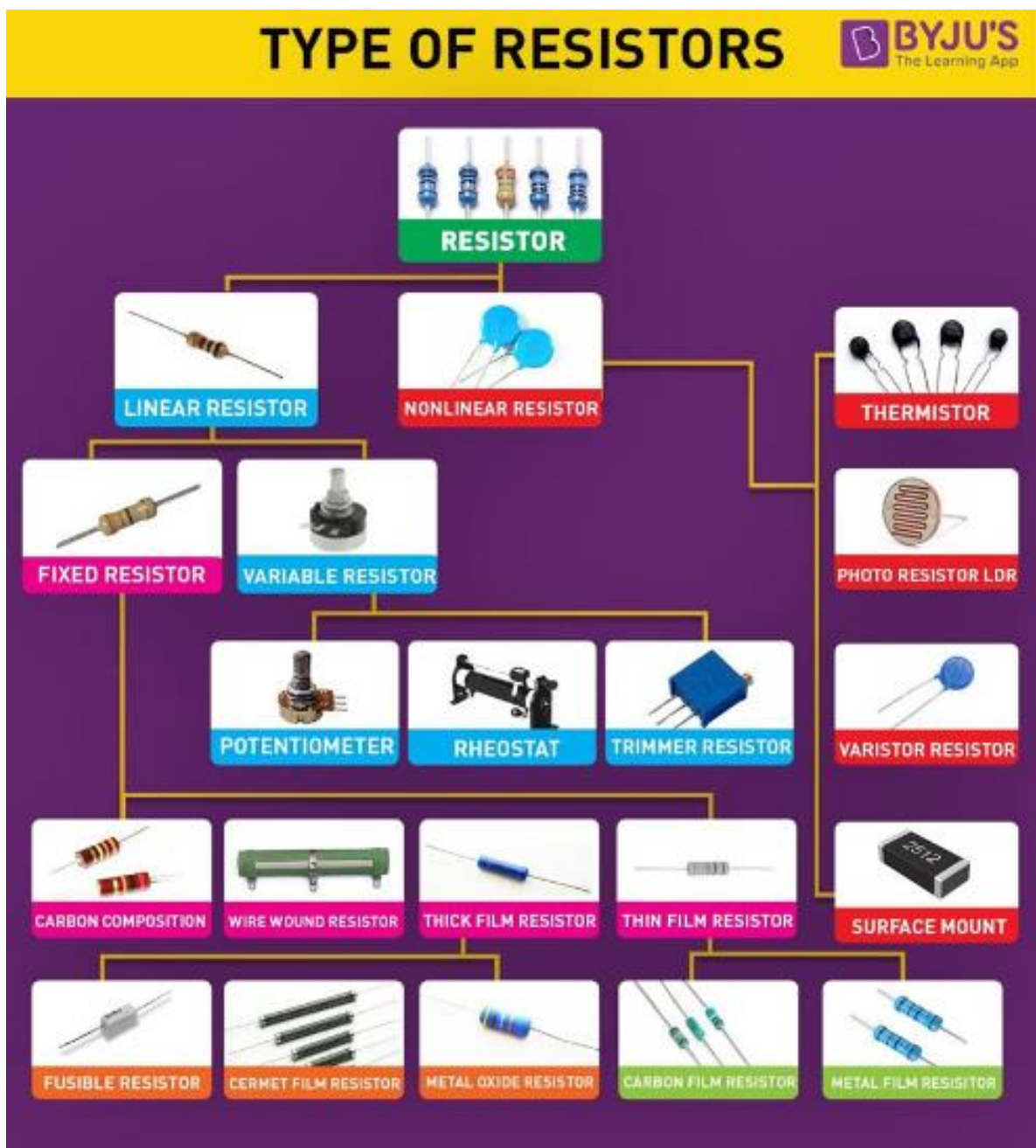
2] Power control circuits- Wire Wound resistors are commonly used in high power applications as they have a high surface area which allows them to dissipate large amount of heat

3] Filter circuits - Used in RC filter circuit in which they offer resistance to the flow of current

4] Protecting Leds from excessive current -They limit current and thus save led from burning.

5] Regulating the flow of current in laptops and mobile chargers -Use to limit current & help dissipate heat

- **Conclusion** : - Major two applications of Resistors is to control/limit current & help dissipate Heat





1st
Digit

2nd
Digit

Multiplier

Tolerance

Black	0	0	x 1	
Brown	1	1	x10	±1%
Red	2	2	x10 ²	±2%
Orange	3	3	x10 ³	±3%
Yellow	4	4	x10 ⁴	±4%
Green	5	5	x10 ⁵	±0.5%
Blue	6	6	x10 ⁶	±0.25%
Violet	7	7	x10 ⁷	±0.1%
Grey	8	8	x10 ⁸	±0.05%
White	9	9	x10 ⁹	
Gold			x10 ⁻¹	±5%
Silver			x10 ⁻²	±10%

CAPACITOR

- **Definition** : -A capacitor is a two terminal device that stores electrical energy in the form of electric field between the charges accumulating on its 2 equi distant metal plates

- **Types**

1] By structure – a. Fixed

b. Variable

c. Trimmer

2] According to polarization : - a.polarized

b. unpolarized

3]Based on above following are types -

- a) Ceramic
- b) Film
- c) Power Film
- d) Electrolytic
- e) Paper
- f)

- **Applications** :

1] Energy Storage – use as a form of a temporary battery for uninterruptible power supplies in electronic devices i.e. to maintain power supply

Eg : used in car sound system to store energy and used when amplifier is activated

2] Power conditioning : -They help power conditioners (a device) to provide consistent energy levels by smoothing current fluctuations , and working as a reserve for the dc power source and bypassing AC currents . This technique is used to reduce noise by separating different parts of circuits

3] Pulsed Power :- Capacitors in the form of capacitor banks can be used for pulsed power applications such as electromagnetic forming , pulsed lasers , particle accelerators and marx generators . Also used as energy sources for detonators in nuclear weapons.

4] Power factor correction - These devices use capacitors to improve energy efficiency , also known as power factor

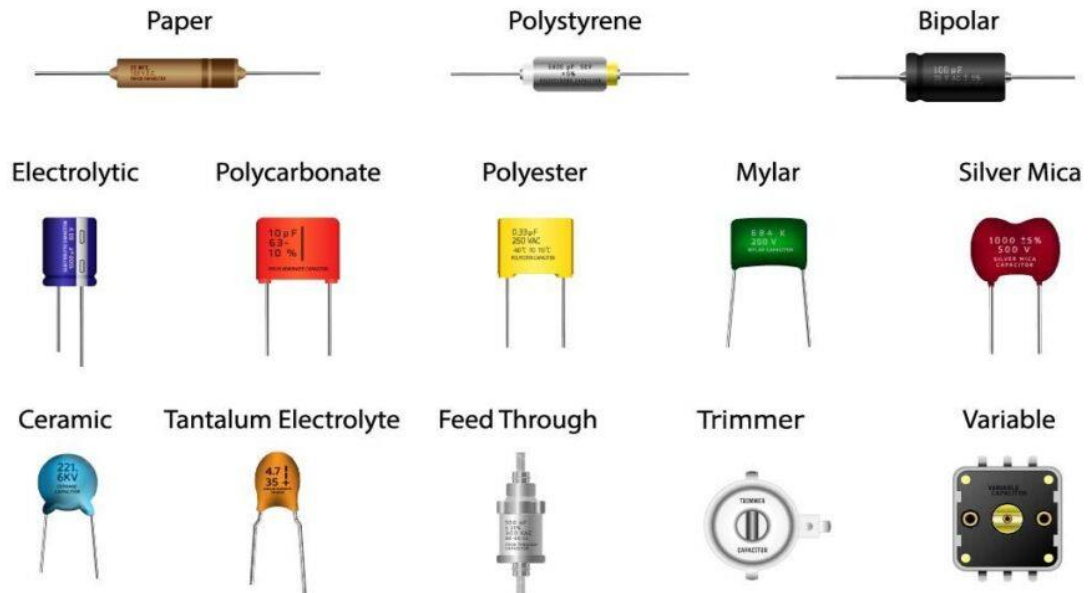
5] Sensors – Capacitors react to changes in external factor like humidity, fuel levels and strain so they are used in sensing applications where they measure it by loss or gain of capacitance.

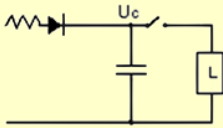

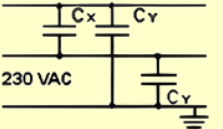
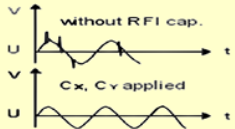
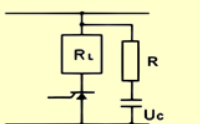

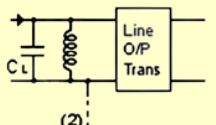
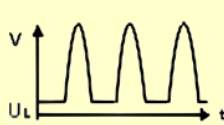
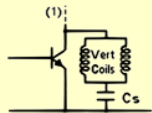
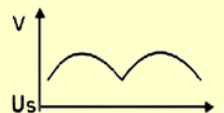
6] Coupling - Capacitors can block DC signals and pass AC Current .

7] Tuning -In LC oscillator

8] Signal Processing -DRAM devices use the energy stored in capacitors to represent information in binary form.

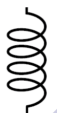




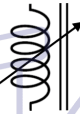






Capacitor Types



Capacitor purpose	Circuit application	Waveform	Capacitor requirements
Energy storage / fast discharge			High pulse rise time rating, High (surge) current carrying capacity
EMI/RFI suppression			Particularly high reliability against active and passive flammability
Snubbing			Low dissipation factor, High pulse rise time rating
TV fly-back tuning			Low dissipation factor, high pulse rise time rating, High dielectric strength
TV S-correction			Low dissipation factor, Good pulse rise time rating

INDUCTOR

- **Definition** : -An inductor is a passive electrical component that stores energy in a magnetic field when electric current flows through it.
- **Types of inductors** : -
 1. RF chip
 2. Air core
 3. Power
 4. Broad bias
- **Applications** : -

Inductor	Fixed	Variable	Pre-set	Shape
Air Core				
Iron Core				
Ferrite Core				

1] Tuning circuits - Used to get the desired frequency.

2] Sensors - Used in traffic signals to detect traffic density.

3] Filters - Used to separate signals of different frequencies.

4] Induction motors - Used to control the speed of the motor.

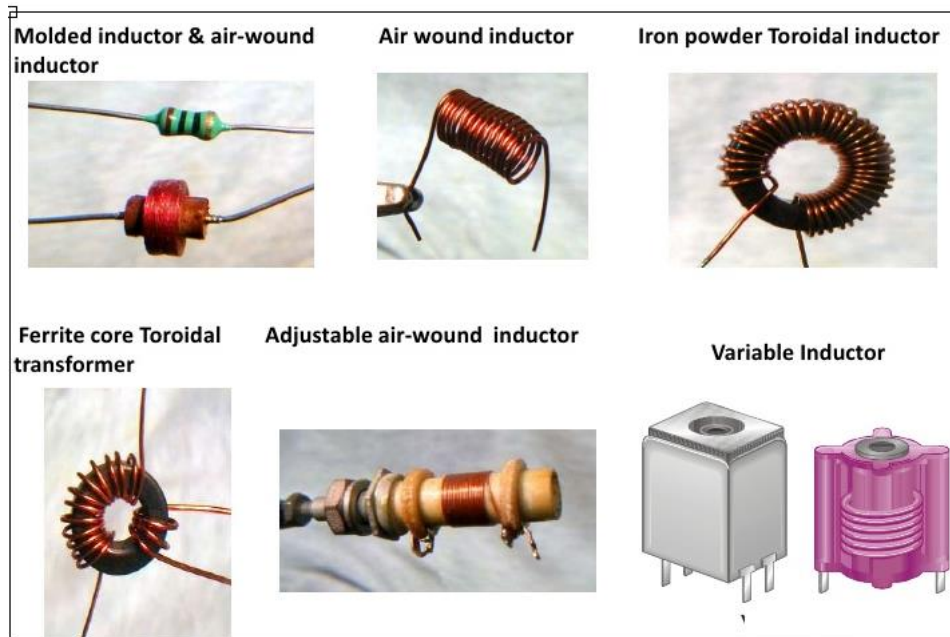
5] Computer circuits - Used to switch power supplies.

6] Energy storage - Used as voltage regulators, ripple reducers, oscillators, resonant circuits, and backup power source

Also used in Transformers , Ferrite beads , Fluroscent tube lights , IF & RF tuning coils





























• **Conclusion** : - Major uses of Inductors are :-

- Choke AC current flow
- Allow DC current to flow freely
- Attenuate high frequency noise in electrical circuits
- Reduce or eliminate high frequency noise in electrical circuits
- Control the speed of motors by connecting them in series or parallel to the shaft



Inductor Symbols

www.electricaltechnology.org

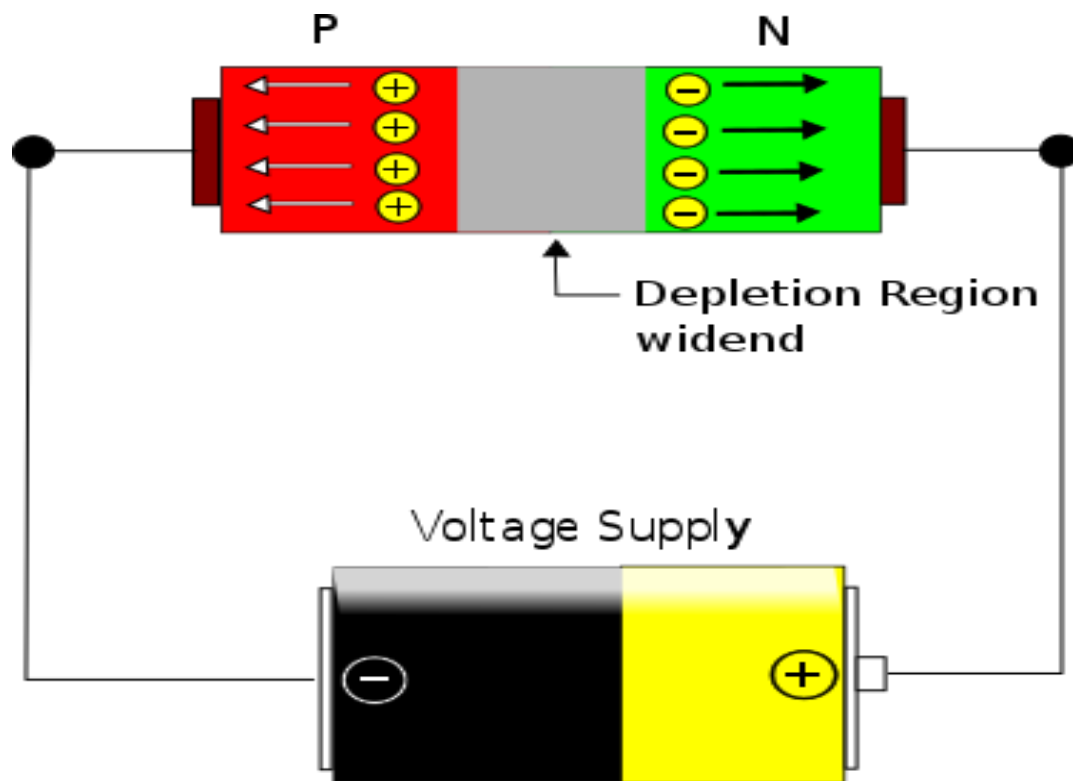
						
Inductor Generic US	FeSi Core inductor	Iron Core Inductor	Iron Core Inductor	Ferrite core inductor	Inductor with Polarity	Analog Delay Line
						
Variable Ferrite Core inductor	Preset Ferrite Core inductor	Continuous variation Inductor	Variable Ferrite Core inductor	Variable Inductor	Stepwise Variable Inductor	Stepwise Variable Inductor
						
Inductance	Inductor International	Inductance with power points	Shielded inductor	Electromagnet Solenoid	Electromagnet Solenoid	Electromagnetic deflection coil
						
Bifilar Inductor	Inductor with Fixed connections	Variometer	Saturable core inductor	Electromagnet	Preset Ferrite Core inductor	Electric motor inductors

Diode

- **Definiton** : - A diode is a semiconductor device that essentially acts as a one-way switch for current.

- **Construction** : -

A diode is constructed by joining two equivalently doped P-Type and N-Type semiconductors. The P-Type semiconductor has excess holes and is of positive charge. The N-Type semiconductor has excess electrons



- **DATASHEET** : -

Electrical Characteristics T_A=25°C unless otherwise noted

Device	Zener Voltage (Note 1)		Z _Z @ I _Z (Ω)		Leakage Current		T _C (mV / °C)		C (pF) V _Z = 0, f = 1MHz
	Min.	Max.	I _Z (mA)	Max.	I _R (μA)	V _R (V)	Min.	Max.	
BZX79C2V4	2.2	2.6	5	100	100	1	-3.5	0	255
BZX79C2V7	2.5	2.9	5	100	75	1	-3.5	0	230
BZX79C3V0	2.8	3.2	5	95	50	1	-3.5	0	215
BZX79C3V3	3.1	3.5	5	95	25	1	-3.5	0	200
BZX79C3V6	3.4	3.8	5	90	15	1	-3.5	0	185
BZX79C3V9	3.7	4.1	5	90	10	1	-3.5	+0.3	175
BZX79C4V3	4	4.6	5	90	5	1	-3.5	+1	160
BZX79C4V7	4.4	5	5	80	3	2	-3.5	+0.2	130
BZX79C5V1	4.8	5.4	5	60	2	2	-2.7	+1.2	110
BZX79C5V6	5.2	6	5	40	1	2	-2	+2.5	95
BZX79C6V2	5.8	6.6	5	10	3	4	0.4	3.7	90
BZX79C6V8	6.4	7.2	5	15	2	4	1.2	4.5	85
BZX79C7V5	7	7.9	5	15	1	5	2.5	5.3	80
BZX79C8V2	7.7	8.7	5	15	0.7	5	3.2	6.2	75
BZX79C9V1	8.5	9.6	5	15	0.5	6	3.8	7	70
BZX79C10	9.4	10.6	5	20	0.2	7	4.5	8	70
BZX79C11	10.4	11.6	5	20	0.1	8	5.4	9	65
BZX79C12	11.4	12.7	5	25	0.1	8	6	10	65
BZX79C13	12.4	14.1	5	30	0.1	8	7	11	60
BZX79C15	13.8	15.6	5	30	0.05	10.5	9.2	13	55
BZX79C16	15.3	17.1	5	40	0.05	11.2	10.4	14	52
BZX79C18	16.8	19.1	5	45	0.05	12.6	12.9	16	47
BZX79C20	18.8	21.2	5	55	0.05	14	14.4	18	36
BZX79C22	20.8	23.3	5	55	0.05	15.4	16.4	20	34
BZX79C24	22.8	25.6	5	70	0.05	16.8	18.4	22	33

• APPLICATIONS : -

1] Rectifiers – A rectifier is an electronic device that converts an alternating current into a direct current by using one or more P-N junction diodes. A diode behaves as a one-way valve that allows current to flow in a single direction.

2] Logic Gates – Diodes are used in logic gates to perform OR and AND logic functions. In these gates, diodes act as electrically operated switches.

3] Clipper Circuits – Clipper circuits remove unwanted parts of an input signal. For example, a biased negative clipper removes input voltage when the input signal voltage becomes greater than the battery voltage. A half wave rectifier removes either the positive or negative half cycle of the input AC signal.

4] Phase Detectors – Diodes are used in phase detectors to detect errors between the microwave VCO frequency and the crystal reference.

5] Diode as Light Source – An LED needs to be a diode, specifically because the way the charge carriers recombine in the forward-biased diode junction releases the correct amount of energy to create photons in the visible range

6] Solar Panel – Diodes are extensively used in solar panel installations. Since the prevent backflow of current (unidirectional flow of current), they are used as blocking devices

7] Zener Diodes - Zener diodes are used for voltage regulation, protection from over-voltage, and in clipping circuits. They are also used in: Reference elements, Surge suppressors, Switching applications, Meter protection applications, Peak clippers

8] - Protection ,Photodiode , Frequency Mixer , Reverse current Protector Light detection, Temperature Sensor

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