Answer on Question #49469, Engineering, Other

Task:

1. How is inductance produced?
2. What kind of cores may be used in inductors?
3. What are the types of inductors? Whats its schematic symbols?
4. How does inductance vary with the permeability of core materials?
5. How is inductance measured?

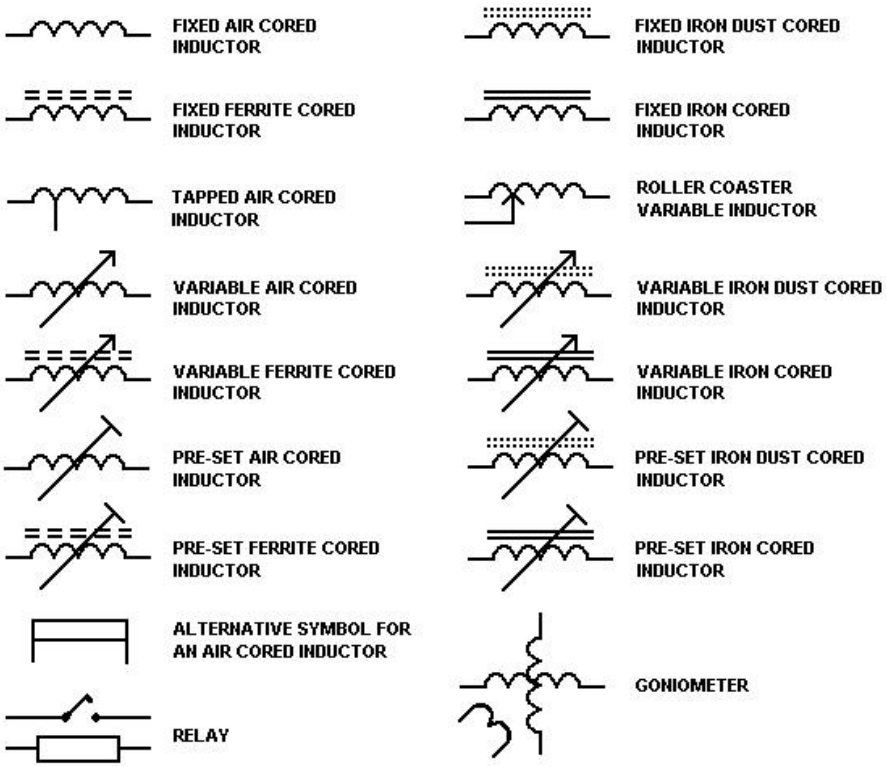
Answer:

1. An inductor is an electrical device that introduces inductance into a circuit. An inductor is a passive electrical component designed to provide inductance in a circuit. It is basically a coil of wire wrapped around an iron core.

2. There are many possible inductor core geometries. A core's geometry depends on various factors, including the application; the available mounting area and volume; the allowable radiation; the limitations on windings; the operating temperature; and how the inductor will be mounted. Consequently, a core's geometrical shape can take the form of a cylinder, bobbin, toroid or several other complex shapes.

A core of inductor made of a magnetic material, like iron, or air-cored.

3. There are many different types of inductors. The different types of inductor have different circuit symbols, as shown below. The alternative symbol is now often used on many circuit diagrams and each of the variants shown can be applied to it. Note that pre-set inductors are sometimes represented by the variable inductor symbol.



4. Air Cored :These types of inductor are usually referred to as coils and are often used as the inductive element in tuned circuits. Another use of air cored inductors is when the inductor consists of a few turns of wire used as a choke in UHF circuits or it consists of a number of self-supporting sections for use as a choke at lower frequencies. Chokes with inductance values of a few microhenrys to several millihenrys are manufactured.
Iron Dust Cored: Small coils are sometimes wound on fixed iron dust cores where they are invariably used as chokes. These components are used at frequencies between about 100kHz and 100MHz and normally have inductances of less than 1 millihenry.
Ferrite Cored: Ferrite cores are used in a manner similar to iron dust cores, except that these components are used at frequencies between about 10kHz and 50MHz. Coils for specific purposes are sometimes wound on pot-cores.Another type of ferrite core is the ring or toroid. These are used in the manufacture of RF chokes and transformers where there is little or no DC current flowing in the windings. Mains filters often employ this type of inductor, where they are connected to provide good common mode signal rejection.
Iron Cored:
Iron cored inductors have many uses, ranging from relay coils and solenoid actuators to low frequency smoothing chokes.

5.

$$L = \frac{n^2 \times \mu_0 \times \mu_r \times a}{l}$$

where: L = inductance in henrys
n = number of turns
μ_0 = permeability of free space ($4\pi \times 10^{-7}$ henrys/metre)
μ_r = relative permeability of core material
a = cross-sectional area of winding in square metres
l = length of winding in metres