

Full Marks : 80

Time : 3 hours

Answers any five questions

Figures in the right-hand margin indicate marks

1. (a) What is ACSR ? Where it is used ? [2]  
 (b) Compare the properties and uses of Copper and Aluminium. [6]  
 (c) Explain the effect of temperature, alloying and mechanical stressing on the value of resistivity of a conducting material. [8]
2. (a) What is skin effect ? [2]  
 (b) Compare the properties and uses of Tungsten and Carbon. [6]  
 (c) What is superconductivity ? Explain the application of superconducting materials. [8]
3. (a) What is Thermistors ? [2]  
 (b) Explain difference between extrinsic and intrinsic semiconductors. [6]  
 (c) Mention the application of semiconductor materials. [8]
4. (a) State the difference between a dielectric material and an insulating material as regard their function. [2]  
 (b) Briefly discuss general properties of insulating materials. [6]  
 (c) What is dielectric loss ? Write the applications of dielectrics. [8]
5. (a) What is Curie point ? [2]  
 (b) Write notes on soft and hard magnetic materials. [6]  
 (c) Write notes on Diamagnetism, Paramagnetism, Ferromagnetism. [8]
6. (a) What are thermocouples ? [2]  
 (b) Explain bimetals and their uses. [6]  
 (c) Write notes on soldering materials, flux. [8]
7. Write short notes any four : [4×4]
  - (a) Silica gel
  - (b) Polyvinyl chloride
  - (c) Mica
  - (d) Porcelain
  - (e) Mercury
  - (f) Hall effect

1. (a) What is ACSR ? Where it is used ?  
 Ans. ACSR conductor is the Aluminium conductor steel reinforced. It is made up of aluminium conductor with steel reinforcement. ACSR conductors are used for overhead transmission lines.

(b) Compare the properties and uses of Copper and Aluminium.

Ans. Copper

- (i) It is reddish in colour
- (ii) It is highly resistant to corrosion. When exposed to atmosphere, copper oxide layer is formed on its surface which acts as a protective layer and prevents corrosion.
- (iii) It can be drawn into very thin wires, sheets and bars of various thickness i.e. it is highly malleable and ductile.
- (iv) It can easily be soldered and welded without the need of any special necessary in electrical wiring.
- (v) Its tensile strength varies from 8.15 to 47.7 N/mm<sup>2</sup>. Its resistivity is  $1.72 \times 10^{-8}$  ohm-m.
- (vi) Uses:
  - (1) It is used for making wires of overhead transmission and distribution of electric power for motor and generator windings. It is also used for high voltage underground cables.

**Aluminium :**

- (i) It is soft and white coloured metal.
- (ii) It offers high resistance to corrosion due to the oxide layer formed on its surface where it is exposed to atmosphere but aluminium oxide layer has higher resistivity and acts as an insulator.
- (iii) It is malleable and ductile and can be drawn into thin wires. It is a good conductor of electricity.
- (iv) Due to the insulating property of the oxide layer formed on the surface where it is exposed to atmosphere it is difficult to solder aluminium. However, special flux is now being used for soldering aluminium wires.
- (v) Its tensile strength varies from 0.95 to 47.7 N/mm<sup>2</sup>. Its resistivity is  $2.8 \times 10^{-8}$  Ω m.
- (vi) It is used in overhead transmission lines, power wiring, flexible wires bus bars, rotor bars of synchronous induction motor.

(Theory—4)

Full Marks : 80

Time : 3 hours

Answers any five questions

Figures in the right-hand margin indicate marks

1. (i) Define superconductivity. 2  
(ii) Explain the differences between intrinsic and extrinsic semiconductor. 6  
(iii) Write notes on hard magnetic materials and their applications.
2. (i) What is covalent bond? 2  
(ii) What are ferrites? What are their chief properties and field of application. 6  
(iii) Explain properties required for being used as an insulator. 8
3. (i) List the materials used for permanent magnet. 2  
(ii) Explain the effect of temperature on resistivity. 6  
(iii) Describe briefly the Hall effect. 8
4. (i) Define Curie point. 2  
(ii) Explain briefly about magnetostriction. 6  
(iii) State the advantages and disadvantages of aluminium as compared to copper for use as a conductor in electricity. 8
5. (i) Mention the specific use of strain gauge. 2  
(ii) What is enamel? State few enamels with their properties. 6  
(iii) How is polyvinyl chloride made? Explain how its properties are affected by adding different materials. Write down some applications. 8
6. (i) Mention the specific uses of paper relating to insulating material. 2  
(ii) Explain briefly about hysteresis loss? 6  
(iii) Draw hysteresis loop for ferromagnetic material and explain. 8
7. Write short notes on any two : 8×2  
(i) Varnishes  
(ii) Paramagnetism  
(iii) Dielectric material.

1. (i) Define superconductivity.

**Ans. Superconductivity :** It is the phenomenon in which a large no. of metals become superconductors below a temperature which is characteristic of a particular metal. It is to be noted that good conductors like Cu, Ag, Au do not exhibit superconductivity, whereas metals and compounds which are superconductors are rather bad conductors at ordinary temperatures.

(ii) Explain the differences between intrinsic and extrinsic semiconductor.

**Ans. Intrinsic Semiconductor :** Intrinsic semiconductors are the purest form of semiconductor. It is brittle and its conductivity is less. They are used only if they are heated or light is used. Pure Ge or Si are the materials. Both holes and electrons are the charge-carriers. Total conductivity is given by  $(N_e e v_e + N_h e v_h)$ .

$v_e$  and  $v_h$  are the mobilities. The conductivity is influenced by the density of energy states. The conductivity influences the electron density in the conduction band. This current is highly temperature dependent.

**Extrinsic Semiconductor**

An extrinsic semiconductor is obtained from the intrinsic semiconductor. When impurities are added to an intrinsic semiconductor, an extrinsic type is formed. The impurities are either trivalent or pentavalent. The process of addition of impurities to an intrinsic semiconductor is called as doping. The pentavalent dopants are P, Sb, As, Bi etc.

The trivalent impurities are B, Al, Ga, In. The conductivity of an extrinsic type is more than that of an intrinsic type. In an extrinsic type, there are half-filled energy bands. In an intrinsic type, the conduction band (c.b.) and valence band (v.b.) are empty.

(iii) Write notes on hard magnetic materials and their applications.

**Ans. A ferromagnetic material is called as a hard magnetic material if it has a high coercive force and high remanent magnetization. Such as (i) Soft magnetic materials. (ii) Hard magnetic materials.**

Magnetic materials which have a steep magnetisation curve, large hysteresis loop, and consequent large energy losses during magnetization are called as Hard magnetic materials.

Example—Carbon steel, tungsten steel, Alnico, Hard ferrites are hard magnetic materials.

III/Sem/Elect/2011 (W)

## ELECTRICAL ENGG. MATERIAL

(Theory-4)

Full Marks : 80

Time : 3 hours

Answers any five questions including Q. No. 1 & 2  
 Figures in the right-hand margin indicate marks

Q.1. Define the following terms : [2×10]

- (a) Insulator
- ✓(b) Fuse Materials
- (c) PVC
- (d) Forbidden energy gap
- ✓(e) Soldering Materials
- ✓(f) Photovoltaic cell
- ✓(g) Superconductor
- (h) Hardness
- ✓(i) Ductility
- ✓(j) Varistors

Q.2. Answer any five questions : [6×5]

- ✓(i) Make a comparison between Conductor and Insulator.
- ✓(ii) State the merits of semiconductor devices used in electrical industry.
- (iii) With neat sketch explain about Hall-effect generator and write their application.
- (iv) What are thermocouple materials ? State their application.
- (v) Write short notes on hard magnetic materials and their application.
- ✓(vi) State the advantages and disadvantages of aluminum as compared to copper for use as a conductor in electricity.
- (vii) What are ferrites ? What are their chief properties and field of application ?

Answer any three

[3×10]

Q.3. Explain with the help of energy diagram  $n$ -type and  $p$ -type semiconductor. [10]

Q.4. Draw hysteresis loop for ferromagnetic material and explain. [10]

Q.5. Distinguish between paramagnetic, diamagnetic and ferromagnetic materials. [10]

Q.6. Mention the specific uses of the following insulating materials. [10]

- (i) Glass
- (ii) Paper
- (iii) Ceramics
- (iv) PVC
- (v) Rubber.

## ANSWERS TO 2011(W)

Q.1.(a) Insulator

**Ans. Insulator :** Insulators are those substances which donot allow the flow of electric current through them.

Ex.- Wood, Glass.

(b) Fuse Materials

**Ans. Fuse Materials :** The material which posses law resistivity, low conductivity and low melting point is knows as Fuse material.

Ex.-Lead and tin alloy, Copper, silver.

(c) PVC

**Ans. PVC :** It is also called as polyvinyl chlor. When acetylene and hydrogen chloride are combine the presence of catalysts like peroxides at about 5 then polyvinyl chloride resin is produced.

(d) Forbidden energy gap

**Ans. Forbidden energy gap :** The separ between conduction band and valence band on the e level diagram is called as forbidden energy Gap. width of the forbidden energy gap is a measure of bondage of valence electrons to the atom.

(e) Soldering Materials

**Ans. Soldering Materials :** The alloy us joining the metals is known as solder. The alloy are used for soldering is called as soldering ma. The most common solder is composed of 50% le 50% Tin. It melting point is 185°C. Tensile stre 385 kg/cm<sup>2</sup> and electrical conductivity is about 1 of copper.

(f) Photovoltaic cell

**Ans. Photovoltaic cell :** Photovoltaic c devices that develop an e.m.f., When illuminated. convert light energy directly into electri

III—SEM / ELECT / 2010(W)

ELECTRICAL ENGG. MATERIAL

## THEORY - 4

Full Marks : 80

Time: 3 hours

Answer five questions including Q. No. 1 &amp; 2

Figures in the right margin indicate marks.

1. Answer with in one or two sentences : [2 x 10

- (i) What is the main effect of temperature on conducting materials ?
- (ii) Write the uses of varistors.
- (iii) Which factors effect's ageing ?
- (iv) What is permittivity ?
- (v) What is the major cause of hum in transformers and chokes ?
- (vi) Write the name of a dehydrating material and its use.
- (vii) What is ACSR ?
- (viii) Write names of five numbers of semiconducting material and its use.
- (ix) What is the effect of porosity ?
- (x) From which alloy permanent magnets are manufactured ?

2. Write short notes on any five : [6 x 5

- (i) Superconductivity and its application.
  - (ii) Brass and Bronze
  - (iii) Tungsten and its use
  - (iv) Solar cell
  - (v) Classify insulating materials on the basis of physical and chemical structure
  - (vi) Glass as insulating material and its use
  - (vii) Impreghated paper, features and applications.
3. Why copper and aluminium are used as current carrying conductor in overhead lines, compare and write their other applications. 10
4. Explain the effect of temperature on resistivity ? 10
5. Explain the principle of thermocouple and different types of thermocouples. 10

6. What do you mean by Intrinsic and Extrinsic Semiconductors ? Explain N-type and P-type materials. 10
7. Write short notes on any two : 10
- (i) Polarisation
  - (ii) Hysteresis
  - (iii) Fuse material

## ANSWERS TO 2010 (W)

1. (i) What is the main effect of temperature on conducting materials ?

Ans. The main effect of temperature on conducting materials are : with the increase of temperature, the resistance will increase and vice-versa.

(ii) Write the uses of varistors.

Ans. The uses of varistors are :

They are used mainly for frequency multipliers, surge diverters and discharge resistors for inductive circuits.

(iii) Which factors effect's ageing ?

Ans. The factors effecting ageing are :

(i) Due to long run of an electrical machine the magnetic substances loses their magnetic properties.

(ii) Insulation problem arises due to it.

(iv) What is permittivity ?

Ans. Permittivity : It is a value found in dielectric materials.

$\epsilon = \epsilon_0 \epsilon_r$  and it is defined as the ratio of capacitance of the condenser system with the insulating material as the dielectric to the capacitance of the condenser system as vacuum as the dielectric.

$\epsilon_0$  = absolute permittivity of free space.

$\epsilon_r$  = relative permittivity of the material.

$\epsilon_0 = 8.856 \times 10^{-12}$  F/m & varies w.r.t. dielectric material.

$\epsilon_r = 1$  for vacuum or air at N.T.P.,  $\epsilon_r > 1$  for liquids, 1 to 10 for normal solid substances.

(v) What is the major cause of hum in transformers and chokes ?

Ans. The major cause of hum in transformers and chokes is magnetostriction.

**5  
SET**

# MODEL SETS QUESTIONS WITH ANSWERS

**SET - 1**

Full Marks : 70

**GROUP - A**

Time: 3 hours

1. Answer all questions :

- What are the commonly electrical contact materials and give their names ?
- What are the types of insulating materials and name them.
- What are the applications of Semiconductor materials ?
- What is bakelite and for what purpose it is used ?
- On the basis of resistivity, what are the types of conducting materials. Give the examples of each.
- What are the uses of platinum and its alloys in contact materials ?
- What is NTC thermistors and what are the uses.
- What are electrolytic capacitors and what are their uses ?
- What is PVC and for what purpose it is used ?
- What are brass and bronze ?

**GROUP - B**

Answer any five questions :

- Glass as insulating material and its use
  - Classify insulating materials on the basis of physical and chemical structure.
- Super conductivity and its application.
  - Brass and Bronze
- What are the commercially available electrical contact materials Explain in brief ?
- What are the difference between Conductors, Semi-Conductors and Insulators ? Explain.
- Explain the principle of thermocouple and different types of thermocouples.
- Polarisation
  - Hysteresis
  - Fuse material

**ANSWERS TO SET - 1**

**GROUP - A**

Q.1.(a) What are the commonly electrical contact materials and give their names ?

Ans. The commonly electrical contact materials are Silver, Copper, alloys of silver, copper i.e. Cu. Tungsten, Platinum and its alloys etc.

(b) What are the types of insulating materials and name them.

Ans. Generally there are three types of insulating materials and they are :

(i) Solid insulators (ii) Liquid Insulator (iii) Gaseous Insulators.

**Solid Insulators** : Abbestos, Bakelite, Cotton, Mica, Micanite, Paper, Ceramics, Rubber, Wax etc.

**Liquid Insulators** : Transformer oils, Pyranol

**Gaseous Insulators** :  $\text{CO}_2$ , air, Nitrogen, Ne, H<sub>2</sub> Ar, Sulphur Dioxide etc.

(c) What are the applications of Semiconductor materials ?

Ans. The application of semi conductor materials are : (i) Rectifiers (ii) Non-linear resistors (iii) P-n junction diodes, transistors, thyristors, photo voltaic cells.

(d) What is bakelite and for what purpose used ?

Ans. It is a synthetic resin obtained by the condensation of formaldehyde with phenol or cresol. It is commonly used for manufacture of all kinds of electrical fittings lamp holders, switches, plugs etc.

(e) On the basis of resistivity, what are the types of conducting materials. Give the examples of each.

Ans. On the basis of resistivity the conducting materials are two types i.e. Low resistivity materials like Cu, Al, Steel, Ag etc.

High resistivity material—Tungsten, Platinum, Manganin, Constanan.

(f) What are the uses of platinum and its alloys in contact materials ?

Ans. The uses of Platinum and its alloys in contact materials are : Magneto Ignition system, Thyristor relays, Sensitive relays, galvanometer contacts, railway signal equipment.

Full Marks : 70

Time: 3 hours

Answer five questions including Q. No. 1 & 2  
Figures in the right margin indicate marks.

**SET - 2**

**GROUP - A**

1. Answer all questions :

- (a) What is a fuse and what are the materials for fuse wire.
- (b) What is dielectric loss ?
- (c) What do you mean by dielectric strength ?
- (d) Give four examples of diamagnetic materials.
- (e) What are hard magnetic materials.
- (f) What are the classification of magnetic materials ?
- (g) What are the commonly used semiconductor materials ?
- (h) What are the applications of semi conductor materials ?
- (i) What are the various p-type materials ?
- (j) Classify various conducting materials ?
- (k) Give a few examples of ceramic materials.

**GROUP - B**

Answer any five questions :

2. What are the various types of insulating materials and explain their applications.
3. What are the classification of dielectrics ?
4. Write in detail about the Hard and Soft magnetic materials ? Explain in brief about soft magnetic material ?
5. Explain with Energy band diagram about conductor, Semi conductor and insulator ?
6. What are semiconductors ? Explain the types of Semiconductor.

**GROUP - A**

Q.1. (a) What is a fuse and what are the materials for fuse wire.

Ans. Fuse is a protective device which consists of a thin wire or strip placed in series with the circuit for protection to that circuit. Current flows through it. The wire melts when large amount of current will flow through it. The materials for fuse wire are tin coated copper, alloy of silver etc.

(b) What is dielectric loss ?

Ans. The absorption of electrical energy by a dielectric material subjected to an alternating electric field is known as dielectric loss.

(c) What do you mean by dielectric strength ?

Ans. It is defined as the maximum magnitude of the applied electric field which a dielectric can withstand without failure of the material.

(d) Give four examples of diamagnetic materials.

Ans. The four examples of diamagnetic materials are : Bi, Cu, Ag, Au.

(e) What are hard magnetic materials.

Ans. These are the ferromagnetic or ferrimagnetic materials in which it is difficult to move the domain walls and the coercive force large. Here the domain walls may be totally immobile and this causes structural defects.

(f) What are the classification of magnetic materials ?

Ans. The classification of magnetic materials are (i) Diamagnetic (ii) Para magnetic (iii) Ferromagnetic (iv) Antiferromagnetic (v) Ferrimagnetic. etc.

(g) What are the commonly used semiconductor materials ?

Ans. The commonly used semiconductor materials are Germanium, Silicon, Gallium Arsenide, Indium Antimonide, Cadmium Sulphide etc.

(h) What are the applications of semiconductor materials ?

Ans. The application of semiconductor materials are (i) rectifiers (ii) non-linear resistors (iii) Temperature

## SET - 3

Full Marks : 70

GROUP - A

Time: 3 hours

## 1. Answer all questions :

- Name the different types of contact materials.
- What are the various types of solder materials ?
- Mention the different types of high resistivity materials.
- What are bimetals and which they are used.
- What is a dehydrating material.
- What are the properties of low resistivity materials.
- What do you mean by Super-conductivity and super conductors ?
- Class-A and Class-H type insulating materials will have how much limiting temp.
- What are the materials used for line insulators ?
- Give four examples of ferro-magnetic materials ?

## GROUP - B

## Answer any five questions :

- What are the conducting material and what are the types of conducting materials explain ?
- What are solder materials also explain about electrical contact materials ?
- What are the commonly used materials for semi conductor explain in brief ?
- What are the commercially available electrical contact materials Explain in brief ?
- What are the difference between Conductors, Semi-Conductors and Insulators ? Explain.

## ANSWERS TO SET-3

## GROUP - A

## Q.1.(a) Name the different types of contact materials.

Ans. The different types of contact materials are :  
(Silver, Silver Palladium), (Silver, Copper Palladium),  
(Silver, Copper), (Copper, Cadmium) etc.

## (c) Mention the different types of high resistivity materials.

Ans. The various high resistivity materials are Alloys of Copper, Nickel, Chromium, Iron, Also Tungston, Nichrome, Platinum, Man

## (d) What are bimetals and where are they used.

Ans. Bimetals are of two metallic metal alloys of different co-efficient of expansion. They are used in electrical appliances such as relays and regulators etc.

## (e) What is a dehydrating material.

Ans. It is a material which is used for dehumidifying and dehydrating purposes. It is used in the moisture content in breather of transformer.

## (f) What are the properties of low resistivity materials.

Ans. The low resistivity materials have the following properties:  
(i) low temperature co-efficient of resistance  
(ii) Good mechanical strength  
(iii) Good Solderability  
(iv) Resistance to corrosion

## (g) What do you mean by Super-conductivity and super conductors ?

Ans. The phenomenon of zero electrical resistance below a certain temperature is called super conductivity and super conductors. Under this condition, the resistance of the material is zero.

## (h) Class-A and Class-H type insulating materials will have how much limiting temperature.

Ans. The limiting temperature for Class-A and Class-H insulating materials are:

(i) 105°C for Class-A

(ii) 180°C for Class-H

## (i) What are the materials used for transmission line insulators ?

Ans. The materials used for transmission line insulators are (i) for transmission line porcelain, (ii) for suspension line glass, (iii) for pin type line porcelain, (iv) for strain line porcelain, (v) for shackle line porcelain, (vi) for post type line porcelain, (vii) for pin type line glass, (viii) for strain line glass, (ix) for shackle line glass, (x) for post type line glass.

## SET - 4

Full Marks : 70

GROUP - A

Time: 3 hours

## 1. Answer all questions :

- List at least five semiconductor common devices ?
- What are the application of super conductors ?
- Enumerate at least four properties of good insulating material ?
- What do you mean by magnet striction ?
- What do you mean by magnetic Anisotropy property in magnetic materials ?
- Draw the B-H curve for hard and soft magnetic materials ?
- Give at least two examples each for hard and soft magnetic materials ?
- Define Curie's law ?
- What are the primary requirement for the Resistor elements ?
- What are the uses of platinum and its alloys in contact materials ?

## GROUP - B

## Answer any five questions :

- What are the requirements of insulating materials ?
- What are the types of insulating materials and their applications ?
- Explain the insulating materials for electrical devices ?
- Write short notes on :
  - P-type semiconductor
  - Polarization of dielectrics
- What are the commercially available electrical contact materials Explain in brief ?

## ANSWERS TO SET-4

## GROUP - A

Q.1. (a) List at least five semiconductor common devices ?

Ans. The five commonly semiconductor devices

(c) Enumerate at least four properties of insulating material ?

Ans. The four properties of insulating material are (i) High-dielectric strength (ii) High thermal stability (iii) High operating temperature (iv) High surface property.

(d) What do you mean by magnetostriction ?

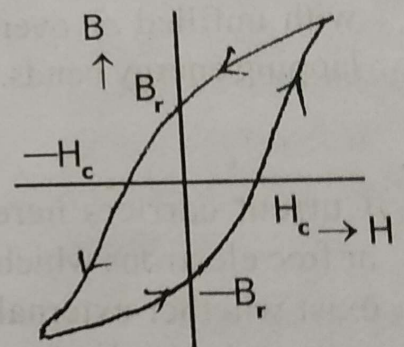
Ans. Magnetostriction is the change in physical dimensions when subjected to a magnetic field.

(e) What do you mean by magnetic anisotropy property in magnetic materials ?

Ans. According to this property, some of the ferromagnetic materials are spontaneously magnetised in the direction of the easy axis.

(f) Draw the B-H curve for hard and soft magnetic materials ?

Ans.



(Hard)

(B-H C

(g) Give at least two examples of soft magnetic materials.

Ans. Two examples of soft magnetic materials are:

- Hardened steel
  - Carbon for non-magnetic
- Soft : (i) Iron-cobalt  
(ii) Nickel-Iron

(h) Define Curie's law.

Ans. The linear relationship between magnetic susceptibility and inverse temperature worked out by Pierre Curie is known as Curie's law.



## SET - 5

Full Marks : 70

Time: 3 hours

## GROUP - A

1. Answer all questions :

- How does the resistivity of semiconductor material varies with temp.
- What is an extrinsic semiconductor material ?
- What is relative permittivity ?
- What is A.A.C ?
- Write names of four numbers of insulating material and their uses ?
- What are the types of magnetic materials and give the examples of each ?
- What do you mean by Hysteresis ?
- What are the constituent parts in manufacturing porcelains ?
- What are the properties of cotton in electrical Engg. purposes ?
- What are high resistivity alloys ? Give example ?
- What type of metals and alloys are used for Fuses ?

## GROUP - B

Answer any five questions :

- Brass and Bronze
  - Super conductivity and its application.
- Solar cell
  - What are the various types of insulating materials and explain their applications.
- What are the classification of dielectrics ?
- What are semiconductors ? Explain the types of Semiconductor.
- What are the conducting material and what are the types of conducting materials explain ?
- Write short notes on :
  - P-type semiconductor
  - Polarization of dielectrics

## ANSWERS TO SET-5

## GROUP - A

Q.1.(a) How does the resistivity of semiconductor material varies with temp.

Ans. The resistivity here is related inversely with temp. because we know that  $R_t = R_o (1 + \alpha t)$

Here ' $\alpha$ ' i.e. Coefficient of coupling is  $\rightarrow$  Resistivity decreases with increase in temp.

(b) What is an extrinsic semiconductor material ?

Ans. The extrinsic semiconductor material is achieved by adding impurities with intrinsic semiconductor. The impurities are either pentavalent or trivalent types.

(c) What is relative permittivity ?

Ans. The relative permittivity ( $\epsilon_r$ ) is a quantity which are generally considered as dielectrics or surrounding medium.

$$\epsilon = \epsilon_0 \epsilon_r, \quad \epsilon_0 = 8.854 \times 10^{-12} \text{ F/m}$$

= absolute permittivity

$$\epsilon_r = \frac{\epsilon}{\epsilon_0}$$

for free space or air medium  $\epsilon_r = 1$   
It varies with respect to the type of dielectric material.  
for Mica,  $\epsilon_r = 5$  etc.

(d) What is A.A.C ?

Ans. Its full form is All Aluminium Conductor. Generally for L.T. lines or in distribution systems, A.A.C conductors are used.

(e) Write names of four numbers of insulating material and their uses ?

Ans. The five no. of insulating materials are:  
i) Porcelain which is used in overhead line system for the insulators (pin type or disc type).  
ii) Varmishes : it is used to insulate coils etc. in elect. machines.

iii) Mica—It is an insulating material with low resistance to certain elect. Contact materials are used for the insulation between segments.

iv) Transformer oil—It is used to insulate coils in a Transformer.