Subject: - Electronic Engineering Materials (22217)

SYLLABUS

Chapter No.	Name of chapter	Marks With Option
1	CONDUCTIVITY OF MATERIALS	18
2	DIELECTRIC MATERIALS	16
3	MAGNETIC PROERTIES OF MATERIALS	16
4	SEMICONDUCTOR MATERIALS	12
5	MICROELECTRONIC COMPONENTS AND SPECIAL MATERIALS	08
	Total Marks :-	102

BOARD THEORY PAPER PATTERN FOR EEM (22217)

Q.1		**Attempt any FIVE** **5*2=10**
	a)	Define resistivity. State its unit.
	b)	State any four dielectric materials.
	c)	Give the material composition for obtaining RED and yellow colour LED.
	d)	State the classification of magnetic material.
	e)	Define intrinsic and extrinsic semiconductor.
	f)	Define Thermionic emission.
	g)	State the impurities for obtaining p-type and n-type semiconductor from intrinsic semi conductor. (2 each)
Q.2		**Attempt any THREE** **3*4=12**
	a)	Describe super conductivity. State its applications.
	b)	Describe the concept of piezo electricity and state its applications.
	c)	State the requirements of good insulating material.
	d)	Describe the effects of temperature on conductivity of metals.
Q.3		**Attempt any THREE** **3*4=12**
	a)	State the materials used for fabrication of photo diode along with its

		Justification.
	b)	Describe the process of photo emission. State the application of photo emission in electronic components
	c)	Describe the principle of thermoelectric. State thermoelectric materials.
	d)	Draw and explain hysteresis loop in magnetic material.
Q.4		**Attempt any THREE** **3*4=12**
	a)	Write one application for the give dielectric material. (i)Polyvinyl Carbide(PVC) (ii)Glass (iii)Mica (iv)Cotton and Silk
	b)	Explain the materials used in wearable antennas with their properties
	c)	Describe dielectric strength and dielectric constant with respect to dielectric materials
	d)	Explain the concept of anti-Ferro magnetism and state its significance.
	e)	Define Electron mobility. State its significance in electronic components.
Q.5		**Attempt any TWO** **2*6=12**
	a)	State the different modes of electron emission in metal. Explain any two modes of emission.
	b)	Define magnetic permeability. State and explain the factors affecting permeability of magnetic materials
	c)	Describe the concept of Ferro electricity. Explain the application of Ferro electric material
Q.6		**Attempt any TWO** **2*6=12**
	a)	(i)Explain the process of diffusion in semiconductor material. (ii)Explain Hall effect.
	b)	Explain magnetostriction property. Explain generation of ultrasonic using magnetostriction
	c)	State any four materials used in fabrication of semiconductor device and describe its need.

CLASS TEST - I

PAPER PATTERN

COURSE: - Electronics & Engineering Material (22217)

PROGRAMME: -Electronics & Telecommunication Engg.

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
1	CONDUCTIVITY OF MATERIALS	CO-217.1
2	DIELECTRIC MATERIALS	CO-217.2
3	MAGNETIC PROERTIES OF MATERIALS	CO-217.3

Q.1	Attempt any FOUR 4*2=8Marks	Course Outcome (CO)
a)	Define superconductivity. State its application	CO-217.1
b)	Define resistivity. State its SI unit.	CO-217.1
c)	List any two examples of ferroelectric materials.	CO-217.2
d)	Give any two properties of polymers.	CO-217.2
e)	Define the term ‘Permeability’. State its unit.	CO-217.3
f)	Give the classification of magnetic materials.	CO-217.3
Q.2	**Attempt any THREE 3*4=12 Marks**	
a)	suggest suitable material for (i) Secondary emission (ii) Photoelectric emission and explain any one emission process. Give one application of each.	CO-217.1

b)	Q.20) Write one property for the given dielectric material i) Ceramic ii) Porcelain iii)Poly vinyl chloride (PVC) iv) Cotton v) Silk vi) Glass	CO-217.2
c)	Explain the concept of anti-Ferromagnetism and state its significance	CO-217.3

CLASS TEST – II

PAPER PATTERN

COURSE: - Electronics & Engineering Material (22217)

PROGRAMME: -Electronics & Telecommunication Engg.

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
3	MAGNETIC PROERTIES OF MATERIALS	CO-217.3
4	SEMICONDUCTOR MATERIALS	CO-217.4
5	MICROELECTRONIC COMPONENTS AND SPECIAL MATERIAL	CO-217.5

Q.1	Attempt any FOUR 4*2=8Marks	Course Outcome (CO)
a)	Give the classification of magnetic material and define magnetic material	(CO-217.3)
b)	Sketch energy band diagram of intrinsic semiconductor.	(CO-217.4)
c)	Pentavalent impurity materials are called as Donor impurity.' Justify your answer.	(CO-217.4)
d)	Give application of micro relays.	(CO-217.5)
e)	List different micro devices.	(CO-217.5)
f)	Define electroluminescence.	(CO-217.5)
Q.2	Attempt any THREE 3*4=12 Marks	

a)	Explain magnetostriction property. Explain generation of ultrasonic using magnetostriction	(CO-217.3)
b)	Describe Hall effect and explain its relation to the mechanical force exerted by magnetic field on a conductor.	(CO-217.4)
c)	Suggest the relevant material in the Flexible and Wearable antennas	(CO-217.5)

COURSE OUTCOME

(CO)

COURSE: - Electronics & Engineering Material (22217)

PROGRAMME: -Electronics & Telecommunication Engg.

Syllabus: -

CO.NO.	Course Outcome
CO-217.1	Choose relevant metal on basis of conductivity property.
CO-217.2	Interpret properties of dielectric materials.
CO-217.3	Select relevant magnetic materials for the specified electronics application.
CO-217.4	Select relevant semiconductor device fabrication materials.
CO-217.5	Select material for the relevant application.

1. CONDUCTIVITY OF MATERIALS

Position in Question Paper **Total Marks-18**

Q.1. a) 2-Marks.
Q.1. b) 2-Marks.
Q.2. a) 4-Marks.
Q.3. a) 4-Marks.
Q.3. d) 4-Marks.
Q.4. a) 6-Marks.

Descriptive Question

Q.1) Define superconductivity. State its application (W-18,S-19)

Q.2) Define electric current and state its SI unit.

Q.3) Define electric charge and state its SI unit.

Q.4) Define electron emission.

Q.5) Define Thermionic emission. (W-18)

Q.6) What is photoelectric emission?

Q.7) What is Thermo e.m.f.

Q.8) What is Electron mobility? State its unit.

Q.9) State thermoelectric effect.

Q.10) List any two application of photoelectric emission.

Q.11) Define resistivity. State its SI unit. (S-18,W-18)

Q.12) Define Conductance. State its SI unit.

Q.13) Which metal has the highest conductivity?

Q.14) Define minimum and threshold frequency.

Q.15) State two important characteristics of metal.

Q.16) List electrical conducting material (any four). (S-18)

Q.17) Define thermocouple

MCQ Question

(Total number of Question=Marks*3=18*3=54)

Note: Correct answer is marked with **bold.**

- **Conductance(G):**
  it is defined as the reciprocal of resistance SI unit-siemens(s)
  conductivity: it is defined as the reciprocal of resistivity.
  It is denoted by **G**.
  SI unit -siemens (S)

$$\mathbf{G = \frac{1}{Resistance}}$$

$$\mathbf{G = \frac{1}{R}}$$

- **Conductivity or specific conductance(6):**
  It is defined as reciprocal of resistivity.
  OR
  It is defined as reciprocal of specific resistance.
  It is denoted by **Sigma(6).**
  SI unit –siemens/meter (S/m)

$$\mathbf{6 = \frac{1}{Resistivity}} \quad \text{OR} \quad \mathbf{6 = \frac{1}{Specific\ Resistance}}$$

$$\mathbf{6 = \frac{1}{\rho}}$$

- **Electric current (I):**
  It is defined as rate of flow of charge is called as electric current.

$$\text{Current} = \frac{Charge}{Time}$$

$$\text{I} = \frac{Q}{t}$$

SI unit – Ampere (A)

- **Resistivity(ρ):**
  It is defined as the resistance offered by the material of conductor having unit length and unit cross sectional area.

$R \alpha \frac{L}{A}$

$R = \text{constant} \times \frac{L}{A}$

$R = \rho \times \frac{L}{A}$

$\rho = \frac{R X A}{L}$

SI unit - $\frac{\Omega m^2}{m}$ = Ωm

Q1.The converse of hardness is known as.....

(a) Malleability (c) toughness

(b) softness (d) none of the above

Q2.On which of the following factor does the resistivity of a material depends?

(a) Resistance of the conductor (c) Length of the conductor

(b) Area of the conductor section **(d) All of the above.**

Q3.Is a negatively charged particle present in an atom……

(a) Proton **(c) Electron**

(b) Neutron (d) none of the above

Q4. A perfect conductor has…….

(a) zero conductivity **(c) Infinite Conductivity**

(b) Unity conductivity (d) none of the above

Q5.A metal having Lowest temperature coefficient of resistance is.....

(a) gold (c) aluminium

(b) copper (d) kanthal

Q6.Commanly used for conducting material are…….

(a) Copper **(c) both (a) and (b)**

(b) aluminium (d) copper and silver

Q7.Which of the following material is preferred for transmitting electrical energy for long distance……..

(a) Copper (c) Steel reinforced copper

(b) Aluminum **(d) Steel reinforced aluminum**

Q8. A highly conductive material must have…….

(a) Highest conductivity (c) Good mechanical strength

(b) lowest temperature coefficient **(d) all of the above**

Q9.The conductivity of conductor can be increased by**…….**

(a) decreasing its temperature
(b) increasing its temperature
(c) Decreasing its vibration
(d) increasing its vibration

Q10.Superconductivity is observed for……

(a) infrared frequencies
(b) d.c. and low frequency
(c) a.c.and high frequency
(d) frequencies having no effect

Q11.A highly conductive material must have……

(a)highest conductivity
(b) lowest temperature coefficient
(c) good mechanical strength
(d) all of the above

Q12.The superconductivity is due to……

(a) the crystal structure having no atomic vibration at 0°K
(b) all electrons interact in the super-conducting state
(c) the electrons jump into nucleus at 0°K
(d) none of the above

Q13.The value of critical field below the transition temperature will…….

(a) increase
(b) decrease
(c) remain unchanged
(d) any of the above

Q14. In a superconductor the value of critical density depends upon……

(a)magnetic field strength
(c) either (a) or (b)
(b) temperature
(d) both (a) and (b)

Q15.High resistivity materials are used in…….

(a) precision instruments
(b) motor starters
(c) heating elements
(d) incandescent lamp
(e) all of the above

Q16.Mercury as an electric contact material is……..

(a) a liquid
(b) a metal
(c) a metal liquid
(d) a gas

Q17.Which of the following resistive materials has the lowest temperature co-efficient of resistance?

(a) Nichrome
(b) Constantan
(c) Kanthal
(d) Molybdenum

Q18. The coils of D.C. motor starter are wound with wire of……

(a) copper
(b) kanthal
(c) manganin
(d) nichrome

Q19. The conductors have transport phenomena of electrons due to……

(a) electric field (c) electromagnetic field
(b) magnetic field (d) none of the above

Q20.By increasing impurity content in the metal alloy the residual resistivity always…….
(a) decreases (c) remains constant
(b) increases (d) becomes temperature independent

Q21. The structure sensitive property of a super conductor is…….
(a) critical magnetic field **(c) critical current density**
(b) transition temperature (d) none of the above

Q22.Which of the following variety of copper has the best conductivity …….
(a) Induction hardened copper
(b) Hard drawn copper
(c) Pure annealed copper
(d) Copper containing traces of silicon

Q23. Constantan contains……
(a) silver and tin (c) tungsten and silver
(b) copper and tungsten **(d) copper and nickel**

Q24.Which of the following is the poorest conductor of electricity?
(a) Carbon (c) Silver
(b) Steel (d) Aluminium

Q25. ……has zero temperature co-efficient of resistance.
(a) Aluminium (c) Porcelain
(b) Carbon **(d) Manganin**

Q26.Solder is an alloy of……
(a) copper and aluminium (c) nickel, copper and zinc
(b) tin and lead (d) silver, copper and lead

Q27. Overhead telephone wires are made of……
(a) aluminium (c) ACSR conductors
(b) steel (d) copper

Q28. Which of the following affect greatly the resistivity of electrical +conductors**?**
(a) Composition (c) Size
(b) Pressure (d) Temperature

Q29. Thermonic emission occurs in……
(a) vacuum tubes (c) ferrite cores
(b) copper conductors (d) transistors

Q30. _____ is a hard solder.

(a) Tin-lead
(b) Tin-silver-lead
(c) Copper-zinc
(d) None of the above

Q31.Addition of 0.3 to 4.5% silicon to iron _____ the electrical resistivity of iron.

(a) increases
(b) decreases
(c) does not change
(d) None of the above

Q32. Super conductivity can be destroyed by_____

(a) adding impurities
(b) reducing temperatures
(c) application of magnetic field
(d) any of the above

Q33. Non-linear resistors_____

(a) produce harmonic distortion
(b) follows Ohm's law at low
(c) result in non-uniform heating
(d) none of the above

Numerical: The resistivity of a pure copper is 1.56μΩcm an alloy of Copper containing 1 atomic percent Nickel has a resistivity of 2.81 μΩcm and alloy of A copper containing the 3 atomic percent silver has a resistivity of 1.98 μΩcm. calculate the resistivity of a copper alloy containing 2 atomic percent Nickel and 2 atomic percent silver.

Solution: Given data

Resistivity of pure copper(ρ cu)

ρ **cu = 1.56 μΩcm**

Resistivity of alloy of copper(ρ cu) and 1 atomic percent.

Nickel = 2.81 **μΩcm**

ρ **(cu+Ni)** = 2.81 **μΩcm**

ρ **Ni =** ρ **(cu+Ni) –** ρ **cu**

= 2.81 – 1.56

ρ **Ni = 1.25 μΩcm**

Alloy of copper containing 3 atomic percent Silver has resistivity of 1.98 **μΩcm**

i.e. ρ **cu + 3 X** ρ **Ag = 1.98**

1.56 + 3 X ρ **Ag = 1.98**

$$\rho \text{ Ag} = \frac{1.98-1.56}{3}$$

ρ Ag = 0.14 μΩcm

To calculate resistivity of copper alloy containing 2 atomic percent Nickel and 2 atomic percent Silver

$$\rho \text{ (cu+Ni +Ag)} = \rho \text{ cu} + 2 \text{ X } \rho \text{ Ni} + 2 \text{ X } \rho \text{ Ag}$$

$$= 1.56 + 2 \text{ X } 1.25 + 2 \text{ X } 0.14$$

$$= 1.56 + 2.5\ 0.28$$

$$= 4.34$$

ρ (cu+Ni +Ag) = 4.34 μΩcm

- **Factor Affecting Resistivity of Electrical Materials:**

1)Temperature: As the temperature increases the resistivity of material increases, hence conducting decreases.

2)Alloying: Addition of another metal to a pure metal will increase the resistivity.hence conductivity decreases.

3)Cold work: Mechanical distortion taking place in metal increases resistivity of a metal thereby decreasing the conductivity.

4) Age hardening: The age hardness of conducting material increases the resistivity which decreases the conductivity.

- **Conducting Material:**

Conducting material are good conductor of electricity and metal are conductivity material Since, conductivity measure a material ability to conduct on electric current.

List electrical conducting material:

Copper, gold, silver, aluminum, iron, mercury, all the metal and sea water etc.

Q34. A carbon resistor contains……..

(a) carbon crystals (b) solid carbon granules

(c) pulverized coal **(d) finely divided carbon black.**

Q35.Which of the following materials does not have covalent bonds ?

(a) Organic polymers (b) Silicon

(c) Metals (d) none of the above

Q36.In graphite, bonding is…….

(a) covalent (b) metallic

(c) Vander Waals **(d) Vander Waals and covalent**

Q37.Total number of crystal systems is…….

(a) 2 (b) 4

(c) 7 (d) 12

• Superconductivity:

The phenomenon of exactly zero electrical resistance is known as super conductivity.

Application:

1) It is used as rail gun and coil gun magnets.
2) It is a used in very powerful electromagnet.
3) It is a used as electric motor and generators.
4) It is a used as fast Digital circuit.
5) It is a used as radio frequency(RF) and micro wave filters (example. mobile phone base station wave as well as military ultra-sensitive for selective receiver)
6) It can also be used for magnetic separation.
7) It is used as low loss power cables.
8) It is a used as high sensitivity particle detector the superconducting tunnel junction detector.
9) It is a used as Kinetic inductance detector and superconducting nanowire single Photon detector it is used for low weight wind turbine.
10) It is a used to build experimental digital computer using switches.

Examples of Superconducting materials:

Aluminium,Tin,Nobelium,lead,Titanium,mercury,zinc etc.

Q38. The conductivity of a metal is determined by…….

(a) the electronic concentration and the mobility of the free electrons

(b) the number of valence electrons per atom

(c) either (a) or (b)

(d) none of the above

Q39.The resistivity of a metal is a function of temperature because……

(a) the amplitude of vibration of the atoms varies with temperature

(b) the electron density varies with temperature

(c) the electron gas density varies with temperature

(d) None of these

Q40.Carbon resistors are used extensively because they are…….

(a) easy to make (b) compact

(c) inexpensive **(d) all of the above reasons**

Q41.Carbon rods are used in wet and dry cells because…….

(a) carbon rod serves as conductor

(b) carbon can resist the attack of battery acid

(c) both (a) and (b)

(d) either (a) or (b)

Q42.Which of the following are non-conductors of electricity?

(a) Non-metal solids except carbon

(b) Air and most other gases

(c) Pure water and liquids in general except mercury

(**d) All of the above**

Q43.Which of the following high resistance materials has the highest operating temperature ?

(a) Kanthal (b) Manganin

(c) Nichrome (d) Eureka

Q44.Steel wire is used as……..

(a) overhead telephone wire (b) earth wire

(c) core wire of ACSR **(d) all of the above**

Q45.Low resistivity materials are used in……

(a) transformer, motor and generator windings

(b) transmission and distribution lines

(c) house wiring

(d) all above applications

Q46. Platinum is used in……

(a) electrical contacts
(b) thermocouple
(c) heating element in high temperature furnace
(d) grids of special purpose vacuum tubes
(e) all of the above

Q47. Steel wire is used as……..

(a) overhead telephone wire (b) earth wire
(c) core wire of ACSR **(d) all of the above**

Q48.Due to which of the following reasons copper and aluminium are not used for heating elements ?

(a) Both have great tendency for oxidation
(b) Both have low melting point
(c) Very large length of wires will be required
(d) All of the above

Q49. Copper, even though costly, finds use in the windings of electrical machines because……..

(a) copper points offer low contact resistance
(b) copper can be easily soldered and welded
(e) copper windings are less bulky and the machines become compact
(d) all of the above

Q50. Which of the following materials is used for making coils of standard resistances?

(a) Copper (b) Nichrome
(c) Platinum **(d) Manganin**

Q51.Which of the following materials is the best conductor of electricity ?

(a) Tungsten (b) Aluminium
(c) Copper (d) Carbon

Q52. Thermocouples are mainly used for the measurement of…….

(a) temperature (b) resistance
(c) eddy currents (d) coupling co-efficient

Q53.Due to which of the following fact, in India, aluminium is replacing copper ?

(a) Aluminium is more ductile and malleable than copper
(b) Aluminium is available in plenty, cheaper and lighter than copper
(c) Aluminium has lower resistivity than that of copper
(d) Aluminium has less temperature co-efficient than copper

Q54.If the resistance of a conductor does not vary in accordance with Ohm's law it is

known as…….

(a) non-linear conductor

(b) reverse conductor

(c) bad-conductor

(d) non-conductor

Q55.Which of the following factors affect resistivity of metals ?

(a) Age hardening (b) Alloying

(c) Temperature (d) Cold work

(e) All of the above

Q56.Superconducting metal in super conducting state has relative permeability of**…….**

(a) zero (b) one

(c) negative (d) more than one

Q57. Electron mobility unit is……

(a) square meter/ volt-sec (b) meter

(c) cubic meter (d) volt/meter

Q58. Types of electron emission is……

(a) Thermal emission (b) Field emission

(c) Secondary emission (d) Photoelectric emission

(e) All of the above

Q59.Thermocouple material is……

(a) Platinum-Rhodium (b) Chromel-Constantan

(c) Iron- Constantan **(d) All of the above**

Q60.Thermoelectric effect are…….

(a) Thomson Effect (b) Seebeck Effect

(c) Peltier Effect **(d) All of the above**

……..……..…XXX……..……

2. DIELECTRIC MATERIALS

Position in Question Paper **Total Marks-16**

Q.1. a) 2-Marks.
Q.1. b) 2-Marks.
Q.2. a) 4-Marks.
Q.3. d) 4-Marks.

Descriptive Question

Q.1) List of dielectric materials.(any four) (S-18)
Q.2) State any four dielectric materials (W-18)
Q.3) List any two examples of ferroelectric materials. (W-18,w-19)
Q.4) Give any two properties of polymers. (S-19)
Q.5) Explain the requirements of good insulating material. (S-19,W-18,S-18)
Q.6) Explain the concept of piezo-electricity and give its two applications. (S-19)
Q.7) Explain the effect of a dielectric on the behaviour of a capacitor. (S-19)
Q.8) Describe the breakdown in solid dielectric materials (S-19)
Q.9) State one application for the given dielectric material: (i) Mica (ii) Rubber (iii) Cotton (iv) Wood (v) Polythene (S-19)
Q.10) Describe the concept of piezo electricity and state its applications. (w-18)
Q.11) Write one application for the give dielectric material. (i) Polyvinyl Carbide(PVC) (ii) Glass (iii) Mica (iv) Cotton and Silk. (w-18,S-19)
Q.12) Describe dielectric strength and dielectric constant with respect to dielectric materials. (w-18)
Q.13) Describe the concept of Ferro electricity. Explain the application of Ferro electric material. (w-18)
Q.14) Describe the effect on the capacitance of the dielectric material on the basis of factors polarizability and permittivity. (S-18)
Q.15) Describe the concept of Ferro electricity. State its applications. (S-18)

MCQ Question

(Total number of Question=Marks*3=16*3=48)

Note: Correct answer is marked with **bold.**

• State any four dielectric materials.

Ceramics, distilled water, paper, mica, polyethylene, and glass. Metal oxides

- **CAPACITANCE :**

Capacitance of a conductor is also defined as the charge required to increase its potential by unity

OR

Capacitance of a conductor is also defined as the ratio of charge to its potential difference.

SI unit of capacitance is farad (F).

$$\mathbf{C} = \frac{\boldsymbol{Charge}}{\textbf{potential differnce}}$$

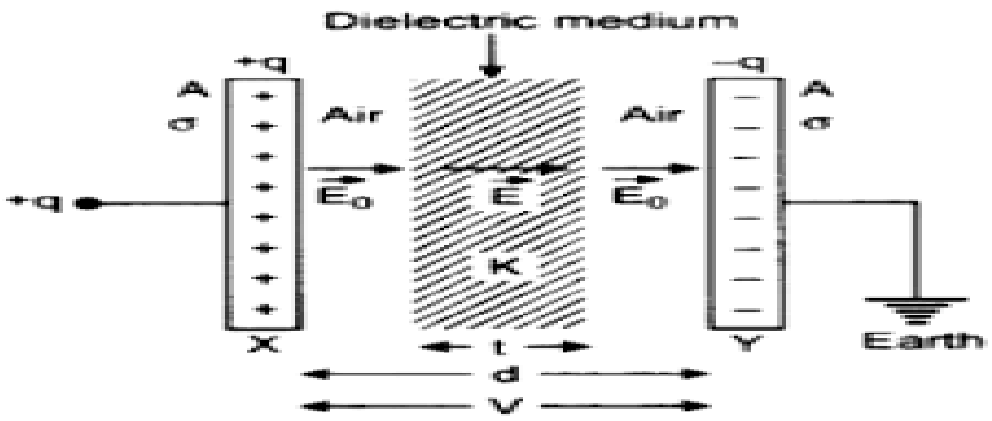
$$\mathbf{C} = \frac{\boldsymbol{Q}}{\boldsymbol{V}}$$

$$\mathbf{1\ farad} = \frac{\mathbf{1}\ \boldsymbol{coulomb}}{\mathbf{1\ volt}}$$

$$\mathbf{1\ farad} = \frac{\mathbf{1}\ \boldsymbol{C}}{\mathbf{1\ V}}$$

Definition: 1 farad- It is defined as the capacitance of a conductor, the potential of which is increased by 1 volt by a charge of 1 coulomb.

- **Effect of Dielectric on Capacitors(Capacitance) :**



A = Area of each metal plate as well as area of metal plate B.

d = distance between two metal plate.

K= Dielectric constant of the medium between them.

+Q = charge given to A

-Q = charge induced on inner side of B.

V_0 = potential difference between two electrodes.

E_0 = Electric field intensity.

We have,

$D = \varepsilon_0 k E$

$D = \varepsilon_0 k E_0$ .....(1)

But $D = \frac{Q}{A}$ and $E_0 = \frac{V_0}{d}$

These value Put in equation (1) we get,

$D = \varepsilon_0 k E_0$

$\frac{Q}{A} = \varepsilon_0 k (\frac{V_0}{d})$ but k=1 for air

$\frac{Q}{A} = \varepsilon_0 (\frac{V_0}{d})$

$\frac{Q}{V_0} = \varepsilon_0 (\frac{A}{d})$ but $\frac{Q}{V_0} = C_0$

$\boldsymbol{C_0 = \varepsilon_0 (\frac{A}{d})}$

Q1.What is the property of insulating materials?

(a) Prevents the unwanted flow of current

(b) Allows the unwanted flow of current

(c) Increases the unwanted flow of current

(d) None of the above

Q2.In the Transmission and Distribution sector, where should the insulators be placed?

(a) Between towers and poles (b) Between towers and ground
(c) Between towers and conductors (d) Between conductors and ground

Q3. How should the properties of strength and dielectric strength in insulating materials?
(a) High strength, low Dielectric strength
(b) Low strength, low Dielectric strength
(c) High strength, high Dielectric strength
(d) Low strength, high Dielectric strength

Q4.What is property of porosity and temperature change in insulating materials?
(**a) Less, less affected** (b) Less, highly affected
(c) High, highly affected (d) High, less affected

Q5.What is the dielectric strength of porcelain insulators?
(**a) 60 kV/cm** (b) 140 kV/cm
(c) 50 kV/cm (d) 40 kV/cm

Q6.What is the dielectric strength, coefficient of thermal expansion of glass with respect to porcelain insulators?
(a) High, high **(b) High, low**
(c) Low, low (d) Low, high

Q7. Glass has lower tensile strength compared to porcelain insulators**.**
(a) True **(b) False**

Q8. What is the other name of Polymer Insulator?
(a) Moisture insulator (b) Core insulator
(c) Composite insulator (d) Mixed insulator

Q9.What is the other name of Polymer Insulator?
(a) Moisture insulator (b) Core insulator
(c) Composite insulator (d) Mixed insulator

Q10.What is the process of producing electric dipoles inside the dielectric by an external electric field?
(a) Polarisation (b) Dipole moment
(c) Susceptibility (d) Magnetisation

- **Describe the breakdown in solid dielectric materials.**

In solids there are three types of breakdown:

1. Electro thermal break down
2. Purely electrical breakdown
3. Electro-mechanical breakdown

1. Electrothermal break down:

- It is due to heat produced by dielectric loss
- Large thickness of dielectric ,high temperature dielectric materials,high applied voltage are responsible for electrothermal breakdown.

2. **Purely electrical breakdown:**
   - This takes place due to collision ionization specially in crystalline solid dielectric
   - The free electron in crystal gets accelerated due to strong applied field, which further liberate more electron
   - Small thickness of dielectric, moderate temperature and low frequency favor electrical breakdown.

3. **Electro-mechanical breakdown:**

   - This generally takes place when the surrounding air has high temperature and humidity. Due to high temperature and humidity the insulation resistance decrease

- **Definition:-**

1) **DIELECTRIC CONSTANT**.-A dielectric characteristic of a material is determined by its dielectric constant. It is a measure of polarization of the dielectrics.
2) **DIELECTRIC STRENGTH-** Dielectric strength is the ability of a dielectric material of specified thickness to withstand high voltages without breaking down.

3) **DIPOLE MOMENT :** The product of the magnitude of the charge (q) and distance between two charges (d) is called as dipole moment.

4) **POLARIZATION :** The process of producing electric dipoles inside the dielectric by the application of an external electrical field is called polarization in dielectric

5) **PERMITTIVITY.:** The permittivity represents the dielectric property of a medium. It indicates easily polarizable nature of material. Its unit is farad/metre

Q11.Which of the following easily adapt itself to store electrical energy?

(a) Passive dielectric
(c) Active dielectric
(b) Superconductor
(d) Polar molecules

Q12.When does a dielectric become a conductor?

(a) At avalanche breakdown
(b) At high temperature
(c) At dielectric breakdown
(d) In the presence of magnetic field

Q13.Which of the following breakdowns occur at a higher temperature?

(a) Avalanche breakdown
(c) Active dielectric breakdown
(b) Electrochemical breakdown
(d) Dielectric breakdown

Q14. When mobility increases, insulation resistance decreases and dielectric becomes conducting.

(a) True (b) False

Q15. Which of the following materials exhibit Ferro-electricity?

(a) Iron (c) Hydrogen

(b) Platinum **(d) Rochelle salt**

Q16. Calculate the dielectric constant of a material which when inserted in parallel condenser of area 10mm × 10mm and distance of separation of 2mm, gives a capacitance of 10^{-9} F.

(a) 8.854×10^{-12} **(c) 2259**

(b) 100 (d) 5354

Q17. Find the capacitance of layer of $A1_2 O_3$ that is 0.5μm thick and 2000mm^2 of square area $\varepsilon_r = 8$.

(a) 1000μF **(c) 16μF**

(b) 0.283μF (d) 2.83μF

Q18. Polymers has ability to pass into a …….

(a) liquid state (c)free dipole

(b) material (d) None of these.

Q19. Transformer oils is used for …….

(a) Flexibility **(c) Impregnation**

(b) mechanical strength (d) None of these.

Q20. Enamel has good ……

(a) Flexibility (c) moulded

(b) resistivity (d) None of these.

Q21. Cotton is ……

(a) Hygroscopic material (c) hard material

(b) plasticity (d) None of these.

Q22. Backelite is ……

(a) Hygroscopic material (c) Plasticity material

(b) hard material (d) None of these.

Q23. PVC long form is ……

(a) Poly Vinyl Chloride (c) Poly Vinyl Carbide

(b) Plastic Vinyl Chloride (d) All of these.

Q24. Porcelain has ……

(a) good plasticity (c) Prevents cracking durinig firing

(b) good moulding property **(d) All of these.**

- **Concept of piezoelectricity:-**
- The phenomenon in which production of polarization, takes place when mechanical stress is applied.
- Piezoelectricity is a special property of certain material which provides us with a means of converting mechanical energy into electrical energy and vice

versa.

- **Examples of Crystal:** Rochelle salt, Quartz and Barium titanate are few piezo materials.

Applications:-

1. Piezoelectric transducers are common in ultrasonic applications, such as intrusion detectors and alarms.

2.Piezoelectric devices are employed at AF (audio frequencies) as pickups, microphones, earphones, beepers, and buzzers.

3.In wireless applications, piezoelectricity makes it possible to use crystals and ceramics as oscillators that generate predictable and stable signals at RF (radio frequencies)

- **Requirements of good insulating material:-**

Requirement of good insulating material are
i) Electrical
ii)Mechanical
iii)Thermal
iv)Chemical

i) Electrical requirement: A good insulating material should have high resistivity and low leakage current. It should have high dielectric strength and small dielectric loss.

ii) Mechanical requirement: A good insulating material should have sufficient mechanical strength to withstand vibrations.

ii) Thermal requirement: A good insulating material should have small thermal expansion to avoid damages, It should be non-ignitable and self-extinguishable.

iv) Chemical requirement: A good insulating material should be resistant to oils,gas, fumes acids and alkalies. It should not absorb water as water reduces insulation resistance and dielectric strength.

Q25. Silk has ……

(a) electric strength
(b) more flexible
(c) takes up less space
(d) All of these.

Q26. Glass has very density about ……

(a) 2000 to 8000 kg/m^2
(b) 2000 to 5000 kg/m^2
(c) 2000 to 3000 kg/m^2
(d) None of these.

Q27. …… has excellent insulation properties**.**

(a) Mica
(b) Ceramic
(c) Bakelite
(d) PVC

Q28. …… is clay product.

(a) Mica
(c) Bakelite
(b) Ceramic
(d) Silk

Q29. …… is clay product.

(a) Mica
(c) Bakelite
(b) Ceramic
(d) Silk

Q30. The break down voltage per unit thickness of dielectric material ……..

(a) breakdown strength
(c) breakdown voltage
(b) electric strength
(d) None of these.

Q31. The break down voltage per unit thickness of dielectric material ……..

(a) breakdown strength
(c) breakdown voltage
(b) electric strength
(d) None of these.

Q32. The applied voltage at which the insulation of the dielectric material is punctured is ……..

(a) breakdown strength
(c) breakdown voltage
(b) electric strength
(d) Dielectric constant.

Q33. Types of insulating material ……..

(a) gaseous
(c) Solid
(b) liquid
(d) All of the above

Q34. Glass dielectric materials ……..

(a) glass fibre
(c) Silica glass
(b) optical fibre
(d) All of the above.

Q35.Ceramic dielectric materials ……..

(a) barium titanate
(c) glass fibre
(b) optical fibre
(d) All of the above

- **Properties and Application of Dielectric Materials :**

1)Mica:

Properties:

1) It has excellent insulation properties.
2) It releases water, when heated.
3) It is an inorganic mineral material.
4) It has best cleavage and splits.

Application

1) It is a used in radio circuits, capacitors, comutator segment pigment insulation radio tube aeroplane spark plugs etc.
2) It is used in in High Voltage machines, traction motors, part of sockets, switches, plugs, fuse, holder, bushings in transformers etc.

2)Ceramic:

Properties:

1) It has resistance to heat.
2) It has a low water absorption.
3) It has low thermal expansion.
4) It has good electric electrical properties.
5) It is a clay product.
6) It is a fused at high temperature of about 1500 degree Celsius.

Application:

1)It is used in transmission distribution lines, transformer bushings, isolators, sockets Plugs, vacuum tubes furnaces, photography pick-up accelerometer etc.

3)Porcelain:

Properties:

1)It has good plasticity.
2)It has good moulding property.
3)It prevents cracking during firing.
4)It reduces the firing temperature

Application:

1) 1)It is used in transmission distribution lines, transformer bushings, isolators, sockets Plugs, vacuum tubes furnaces, photography pick-up accelerometer etc.

4)Polyethylene:

Properties:

1) It has its extremely low power factor at a radio frequencies.
2) It has a very low dielectric losses
3) It is a length and flexible.

4) It is susceptibility to exposure to sunlight.
5) It improves its resistance to weathering by pigmenting with a small percentage of a carbon.
6) It has a high resistance to moisture penetration.
7) It has a high dielectric strength
8) It has a low permittivity and low volume resistivity.

Applications :

1)it is a used for cables and insulating wires for radio frequency work

5) Bakelite:

Properties:

1) It is a hard material.
2) It is a thermosetting material
3) It is a dark colour material
4) It has high mechanical strength

Application

1)it is a widely used for molded parts such as a lamp holder terminal blocks switch covers instrument cases small ponds etc.

6) Poly Vinyl Chloride (PVC)

Properties:

1) It has the high mechanical strength
2) It has a very high resistivity.
3) It has a higher flexibility.
4) It is Resistance to oils, liquids, gas, fumes chemical etc.

Application : 1)It is a used for jacketing in insulation of a wires and cables.

3) it can be used to replace to a great extent.

7) Rubber:

Properties:

1) It is an elastic substance.
2) The natural rubber is obtained from SAP (latex) trees.
3) The natural rubber dissolves in hydrocarbons.
4) The vulcanized rubber is stretchable and Elastic.
5) The synthetic rubber is a resistant to acid, kerosene etc.

Application :

1)It is a used in flexible wires,jack card and installations wires.

2) It is used to manufacturing tube, Tyres etc.

8) Cotton:

Properties:

1)It is hygroscopic materials.
2)It has low electric strength.
3)It has low mechanical strength.

Application:

1) The cotton covered wire is widely used in winding of small magnets coils, armature winding of small and medium sized mechanics.

9) Silk :

Properties:

1)It has electric strength.
2)It is more flexible.
3)It takes up less space.
4)It is less hygroscopic.

10) Glass:

Properties:

1)It is a thermoplastic inorganic material.
2)It is flexible & forms a thread, tape etc.
3)It has high refractive index.
4)It has very high density

Application:

1) Alkaline glasses are used for optical and electrical applications.
2) Installation glasses are used as enclosure for bulbs and electron tubes.
3) Glass fibre fibers are used to make cloth tapes.
4) Optical fibres are used in communication and computer for transmission of a signals.
5) Pyrex glasses are used for oven utensils
6) Glass is used in electric light tubes, electric valves, X- ray tubes and as a dielectric material in capacitors.

11) Paper:

Properties:

1) It is made from cellulose, glass asbestos, soft wood fibres, etc.

2) Thickness density, finish, porosity, tensile strength and dielectric loss are its important and useful physical properties.
3) It can be impregnated to improve the electrical properties.
4) It is fibrous insulating material

Application

1) It used as layer or spacer in transformer.
2) It is used in capacitors,cable and winding.

12) Paper and Boards:

Properties:

1) It has high heat resistant.
2) It has higher mechanical strength.
3) It has high flexibility.

Application

1) It can be used as impaired in pregnant material.
2) It is used in High Voltage transformer and winding.
3) It is used in the manufacture of various forms of insulating boards and tubes.

13)Wood:

Application:- 1) It is a used for terminal blocks, wedges for armature winding,operating rods in a high voltage Switchgear and low voltage distribution line supports.

14)Enamel:

Properties:

1) it is a fusible insulated coating with a organic base.
2) It has a good flexibility and viscosity.

Application:

1) It is a used for the coating wires, stationary and rotating part of electric machines.

15)Transformer Oils:

Properties:

1) It has a higher resistivity.
2) It has a lower dielectric loss.
3) It has small viscosity.
4) It has a higher heating capacity.
5) It has a low density.

Application: 1) it is used High Voltage Transformer, capacitors.
2)it is used for impregnation.

16)Polymers:

Properties:

1)It has ability to soften and even melt.

2)It has ability to pass into the liquid state.

3) It has a insolubility in water and solubility in one and or more organic solvents.

4) It can be spoon into fibre.

5) it can be molded.

Application: 1) it is used to produce yarns, cloth and films.

Q36.Fibrous dielectric materials ……..

(a) Resins (c) Rayon

(b) Varnishes **(d) All of the above**

Q37.Mineral dielectric materials ……..

(a) Asbestos (c) Mica

(b) Vinyl **(d) All of the above**

Q38.The reciprocal of power factor is called ……..

(a) Q-factor (c) Dielectric constants

(b) power factor (d) All of the above

Q39.The complementary angle is called ……..

(a) Q-factor **(c) Dielectric loss angle**

(b) power factor (d) Dielectric constant.

Q40.The tangent value of dielectric loss angle is called ……..

(a) Q-factor (c) Dielectric loss angle

(b) power factor (d) Dielectric constant.

Q41.The product of relative permittivity and power factor is called ……..

(a) Dielectric loss factor (c) Dielectric loss angle

(b) power factor (d) Dielectric constant.

Q42.The loss per unit volume of the dielectric material is called ……..

(a) Dielectric loss factor (c) Dielectric loss angle

(b) Specific dielectric loss. (d) Dielectric constant.

Q43.The dielectric material are……..

(a) Mica (c) Ceramic

(b) glass **(d) All of the above.**

Q44.Requirment of good insulating material……..

(a) Electrical (c) Chemical

(b) mechanical **(d) All of the above.**

Q45.The temperature exceeds a certain value ……..

(a) Curie point
(b) mechanical strength
(c) Chemical strength
(d) None of the above.

Q46.Example of Ferro electricity material ……..
(a) Rochelle salt
(b) Pottassium dihydrogen phosphate
(c) barium titan ate
(d) All of the above.

Q47.SI unit of capacitance is ……..
(a) meter
(c) farad
(b) centimeter
(d) volt

Q48.SI unit of capacitance is ……..
(a) meter
(c) farad
(b) centimeter
(d) volt

Q49.formula for capacitance is ……..
(a) C= Q/V
(c) C = Q - V
(b) C= Q X V
(d) Q= CV

Q50.Electrical Requirements' ……..
(a) High restivity
(c) high dielectric strength
(b) Low density
(d) All of the above.

……..XXXXXXX……

3. MAGNETIC PROPERTIES OF MATERIALS

Position in Question Paper **Total Marks-16**

Q.1. a) 2-Marks.
Q.1. b) 2-Marks.
Q.2. a) 4-Marks.
Q.3. d) 4-Marks.

Descriptive Question

Q.1) Define the term 'Permeability'. State its unit.(S-18)

Q.2) Give the classification of magnetic materials.(S-19)

Q.3) Explain various factors that affecting the permeability.(S-19)

Q.4) Draw and explain the typical magnetization curve for a ferromagnetic material. State the application of ferromagnetic materials. .(S-19)

Q.5) Explain the properties of magnetic materials with examples: (i)Permanent magnetic dipole (ii)Para magnetism(iii)Diamagnetism(S-19)

Q.6) State the classification of magnetic material.(W-18)

Q.7) What the term 'Permeability'?

Q.8) Explain the origin of permanent magnetic dipoles.

Q.9) Explain briefly the following magnetic material :i) Diamagnetic

ii) Paramagnetic iii) Ferromagnetic.

Q.10) List few examples of ferromagnetic materials.

Q.11) State magnetostriction effect**.**

Q.12) Write a short note on magnetostriction.

Q.13) What is hysteresis loop? Explain it briefly.

Q.14) State the factor affecting permeability and hysteresis loss.

Q.15) Describe the concept of piezo electricity and state its applications.(W-18)

Q.16) Draw and explain hysteresis loop in magnetic material. (W-18)

Q.17) Explain the concept of anti-Ferromagnetism and state its significance. (W-18)

Q.18) Explain the concept of anti-Ferromagnetism and state its significance

MCQ Question

(Total number of Question=Marks*3=16*3=48)

Note: Correct answer is marked with **bold.**

- **Classification of Magnetic Material**

- **Diamagnetic Materials:** (**Diamagnetism)**

The material in which the permanent magnetic dipoles are totally absent are called as the diamagnetic material.
for example: Bismuth, Antimony, Copper, Gold, Silver, zinc, Mercury, Diamond, graphite,Germanium,silicon, benzene and glass etc.

- **Paramagnetic Materials: (Paramagnetism)**

The dipole moment are randomly oriented and if the interaction among the permanent dipole moment is a zero or negligible the material is called as paramagnetic material.
for example: aluminium, Platinum, Chromium, Nitrogen, Oxygen, Tungsten,Titanium.etc.

- **Ferromagnetic Materials: (Ferromagnetism)**

If the dipole moment in a material line themselves up in parallel to each other then the material is called as a ferromagnetic material.
for example: iron, steel, Nickel, Cobalt, cadmium,gold, Silicon iron, superalloy.

- **Antiferromagnetic Materials: (Anti-ferromagnetism)**

When the neighboring dipole moment are aligned in antiparallel then the material is called as antiferromagnetic material.
for example: Cobalt oxide, Nickel oxide, chromium.

- **Ferrimagnetic Materials: (Ferrimagnetism)**

This material have an equal magnetic moment and are lined-up anti parallel to each other is known as Ferrimagnetic Materials.
for example:ferrite, magnetic garnet, magnetite.

- **Permanent magnetic dipole:**

  Whenever a charged particle has an angular momentum, it will contribute to the permanent dipole moment. These occur when two atoms in a molecule have substantially different electronegativity: One atom attracts electrons more than another, becoming

more negative, while the other atom becomes more positive. A molecule with a permanent dipole moment is called a polar molecule.

Q1. Which of the following parameter is used to assess the magnetic ability of a materials?
(a) Magnetic flux density
(b) Magnetic dipole moment
(c) Magnetization
(d) Susceptibility

Q2. For a diamagnetic material, which of the following statement is correct?
(a) Magnetic susceptibility < 0
(b) Magnetic susceptibility = 0
(b) Magnetic susceptibility > 0
(d) Magnetic susceptibility = 1

Q3. For a diamagnetic material, which of the following statement is correct (μ_r = relative permeability)?
(a) $\mu_r > 2$
(b) $\mu_r > 1$
(c) $\mu_r < 1$
(d) $\mu_r = 1$

Q4. For a paramagnetic material, which of the following statement is correct?
(a) Magnetic susceptibility < 0
(b) Magnetic susceptibility = 0
(c) **Magnetic susceptibility > 0**
(d) Magnetic susceptibility = -1

Q5. For a paramagnetic material, which of the following statement is correct (μ_r = relative permeability)?
(a) $\mu_r = 0$
(c) $\mu_r > 1$
(b) $\mu_r < 1$
(d) $\mu_r < 0$

Q6. What is the curie temperature of iron (in Kelvin scale)?
(a) 2195 K
(c) 895 K
(b) 495 K
(d) 1095 K

Q7.With an increase in temperature, magnetic susceptibility of a ferromagnetic material _____?
(a) Increases
(b) Remains constant
(c) Decreases
(d) First increases and then decrease

Q8. With an increase in temperature, magnetic susceptibility of an anti-ferromagnetic material _____?
(a) Increases
(b) First decreases and then increases
(c) Decreases
(d) First increases and then decreases

Q9. With an increase in the area of hysteresis curve, power loss will _____
(a) Increases
(c) First decreases and then increases
(b) Decreases
(d) First increases and then decrease

Q10. Magnetic Bubbles are used as _____
(a) Storage device
(c) Thermostat
(b) Strain gauge
(d) Potentiomete

Q11.What is the property of magnetic materials?
(a) Resistivity
(c) Permeability
(b) Conductivity
(d) Ductility

Q12. What is the property of permeability in magnetic materials?
(a) how easily the magnetic flux is broken/clear

(b) how easily the magnetic flux is set up
(c) how long the magnetic flux takes to form
(d) how long the magnetic flux takes to clear

Q13. What is the representation of permeability?
(a) coercivity/retentivity
(b) flux/flux density
(c) magnetic force/magnetic flux density
(d) magnetic flux density/magnetic force

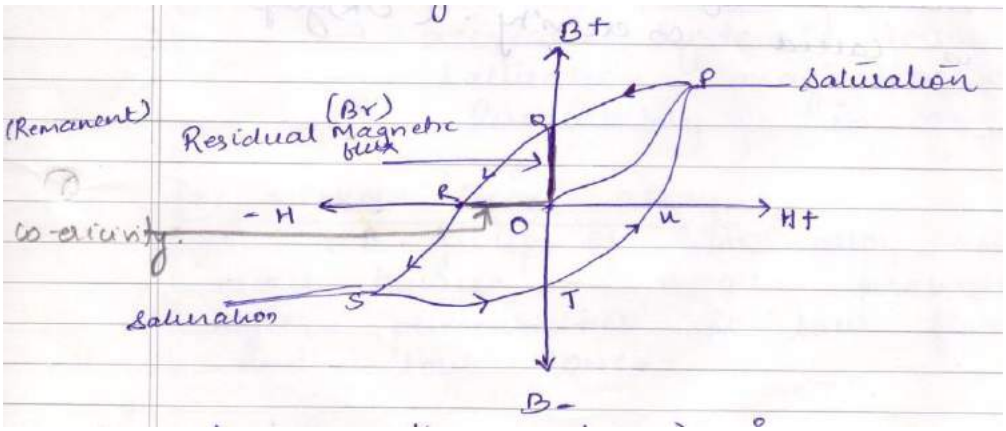
Q14. How should the permeability and number of ampere turns for good magnetic materials be?
(a) high permeability, high ampere turns
(b) high permeability, low ampere turns
(c) low permeability, low ampere turns
(d) low permeability, high ampere turns

Q15. Is retentivity associated with B-H curve?
(a) Yes (b) No

Q16. What is the property of retentivity in magnetic materials?
(a) After removal of external magnetic fields, magnetization exists
(b) After removal of external magnetic fields, magnetization doesn't exist
(c) After removal of internal magnetic fields, magnetization exists
(d) After removal of internal magnetic fields, magnetization doesn't exist

Q17. What is coercivity force in magnetic materials?
(a) The force required to add upon the existing magnetization
(b) The force required to remove the existing magnetization
(c) The force required to produce magnetic flux
(d) The force required to break magnetic flux

- **Draw and explain the typical magnetization curve for a ferromagnetic material. State the application of ferromagnetic materials.**



Explanation:

By plotting values of flux density, (B) against the field strength, (H) we can produce a set of **curves** called **Magnetization Curves**, Magnetic Hysteresis **Curves** or more commonly B-H **Curves.** The phenomenon of magnetization and demagnetization of ferromagnetic material is known as hysteresis.
It is observed that as the electric field increases magnetic field(H) increases and therefore magnetic flux density (B) also increases, but when it decreases, B does not decreases at the same rate at which it was increased.
The magnetic material does not get demagnetized it retains some magnetization this is hysteresis.
As magnetic field (H) increases, the magnetic flux density (B) too increase, but B stop increasing and reaches saturation. The curve OP is saturation curve when it decreases the curve does not follow the path, it follows different path PQ. That means rate of decrease of B is not same as rate of increase of B.
When magnetic field (N) reaches zero H=0, that means B should be zero but B≠0, that means material does not get demagnetized there is some residual magnetism i.e. OQ (graph is Remnant flux density Br.
When H is increased in reverse direction B also increases in reverse direction and again get S The magnetic flux density (B) becomes zero when reverse magnetic force is applied that is called coercitivity (OR) graph saturated.

Application of ferromagnetic material:

1) It is used as a preferable choice for aviation instrumentation, electronic tubes, electromagnetic valve, magnetic separator and electromagnetic shielding**.**

Q18.What are magnetic hard materials?

(a) High retentivity, low coercivity
(c) Low retentivity, low coercivity
(**b) High retentivity, high coercivity**
(d) Low retentivity, high coercivity

Q19. What is reluctance in magnetic materials?

(a) Allows the buildup of magnetic flux
(**c) Resists the buildup of magnetic flux**
(b) Reduces the buildup of magnetic flux
(d) Increases the buildup of magnetic flux

Q20. High Reluctance affects the performance of magnetic materials.

(**a) True**
(b) False

Q21. What is the unit of reluctance in magnetic materials?

(a) Henry/m
(**c) Ampere-turns/Weber**
(b) Weber/m2
(d) Ampere-turns/m

Q22. How many classifications of magnetic materials are present?

(a) 3
(c) 5
(b) 4
(d) 6

Q23.What is the property of ferromagnetic materials?

(a) Negative magnetization
(b) Magnetization slightly less than 1
(c) Magnetization slightly greater than 1
(d) Magnetization very much higher than 1

Q24. What is the example of diamagnetic materials?

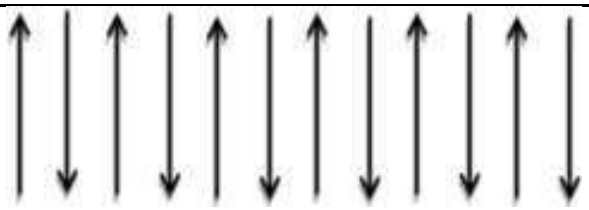
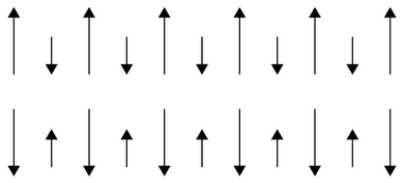
(a) Quartz
(c) Montmorillonite
(b) Pyrite
(d) Biotite

Q25. What is the example of ferromagnetic materials is?

(a) Magnetite
(c) Nickel
(b) Hematite
(d) Biotite

Q26. A permanent magnet……

(a)Attracts some substances and repels others
(b) Attracts all paramagnetic substances and repels others
(c)Attracts only ferromagnetic substances
(d)Attracts ferromagnetic substances and repels all othe

Sr.no	Anti-ferromagnetism	Ferrimagnetism
1	When the neighbouring magnetic moments are aligned anti-parallel this phenomenon is called anti-ferromagnetism	When the neighboring magnetic moments are aligned anti-parallel of unequal moments this phenomenon is called ferrimagnetism
2		
3	The molecular moment will be zero	The molecular moment is in between that of anti-ferromagnetic and ferromagnetic material
4	Examples of anti-ferromagnetic material are manganin, ferric chloride,chromium,nickel oxide,cobalt oxide,ferrous oxide.	Examples of anti-ferromagnetic materialare ferrite, magnetic garnets,magnetite

Q27. The relative permeability of .....materials is not constant.

(a)Diamagnetic **(b) Ferromagnetic**

(c) Paramagnetic (d) Insulating

Q29. Degaussing is the process of…….

(a) Removal of magnetic impurities (c) Remagnetising metallic parts

(b) Removing gases from the materials **(d) Demagnetising metallic parts**

Q30. In the left hand rule, forefinger always represents…….

(a) Voltage (d) Direction of force on the conductor

(b) Current

(c) Magnetic field

Q31. The ratio of intensity of magnetisation to the magnetisation force is known as…….

(a) Flux density (c) Relative permeability

(b) Susceptibility (d). None of the above

Q32. The uniform magnetic field is…….

(a) The field of a set of parallel conductors

(b) The field of a single conductor

(c) The field in which all lines of magnetic flux are parallel and equidistant

(d) None of the above

Q33.The stray line of magnetic flux is defined as…….

(a) A line vertical to the flux lines

(b) The mean length of a ring shaped coil

(c) A line of magnetic flux in a non-uniform field

(d) A line of magnetic flux which does not follow the designed path

Q34.The unit of flux is the same as that of……

(a) Reluctance (c) Permeance

(b) Resistance (d) **Pole strength**

Q35.Magnetism of a material can be destroyed by……

(a) Heating

(b) Hammering

(c) By inductive action of another magnet

(d) **By all above methods**.

Q36.Which of the following is the unit of magnetic flux density ?

(a) Weber **(c) Tesla**

(b) Lumens (d) None of the above

Q37.Which of the following is a ferromagnetic material?

(a) . Tungsten (c) Copper

(b) Aluminium **(d) Nickel**

Q38.Reciprocal of permeability is…….

(a) **Reluctivity** (c) Permittivity

(b) Susceptibility (d) Conductance

Q39.Which of the following is expected to have the maximum permeability ?

(a) Brass (c) Zinc

(b) Copper **(d) Ebonite**

Magnetic Material:

- **Iron and Silicon Iron Alloy:**
- **Nickel-Iron Alloy.**

1.Iron and Silicon Iron Alloy:

- The magnetic property of iron can be improved by adding Silicon of 0.3 to 4.5 % by weight. This increases electrical resistivity of iron and so reduces iron losses due to Eddy current in the material. it also decreases hysteresis losses.
- if a silicon percentage is increase in iron saturation magnetization decreases and permeability increases.
- **Example:**
- for electric machines low Silicon content iron is preferred to active high value of flux density
- for a large Turbo generator iron with large Silicon content are used as magnitude of losses is less

2.Nickel-Iron Alloy.

A group of iron alloys containing Nickel between 40 to 90% under proper heat treatment while manufacturing provides higher permeability is at a low flux densities and low losses.

Example : permelloy and mumetal . metal has - low permeabilities,-high electrical resistance, low Eddy current losses.

so addition of a small amount of other element to Nickel iron alloys improve their magnetic properties Like Cobalt reduce hysteresis manganese reduces coercivity etc.

Application : the saturation flux density of Ni-Fe (Nickel iron) is a low they are used in

1.Transformer cores, loading coils of a telephone circuits,

2.Instrument Transformers.

3.Magnetic circuit of the measuring instrument.

Q40. The magnetic reluctance of a material…….

(a) **Decreases with increasing cross sectional area of material**

(b) Increases with increasing cross sectional area of material
(c) Does not to vary with increasing cross-sectional area of material
(d) Any of the above

Q41. Magnetic moment is a…….
(a) Pole strength
(b) Universal constant
(c) Scalar quantity
(d) Vector quantity

Q42. Core of an electromagnet should have……
(a) Low coercivity
(b) High susceptibility
(c) **Both of the above**
(d) None of the above

Q43. Strength of an electromagnet can be increased by.....
(a)Increasing the cross-sectional area
(b)Increasing the number of turns
(c) Increasing current supply
(d) All of the above

Q44. Temporary magnets are used in…….
(a) . Loud speakers
(b) Generators
(c) Motors
(d) All of the above

Q45. Which of the following materials are diamagnetic?
(a) Silver
(b) Copper
(c) Silver and copper
(d) Iron

Q46. Magnetism of a magnet can be destroyed by…….
(a) Heating
(b) Hammering
(c) By inductive action of another magnet
(d) All the above methods

Q47. The bar magnet has……..
(a) The dipole moment
(b) Monopole moment
(c) Both A and B
(d) None of the above

Q48. The commonly used material for shielding or screening magnetism is……..
(a) Copper
(b) Aluminium
(c) Soft iron
(d) Brass

Q49. Paramagnetic materials have relative permeability…….
(a) Slightly less than unity
(b) Equal to Unity
(c) Slightly more than unity
(d) Equal to that ferromagnetic materials

Q50. Supermagnetic materials are composed of…….
(a) Ferromagnetic particles in ferromagnetic matrix
(b) Non-ferromagnetic particles in ferromagnetic matrix
(c) Ferromagnetic particles in non-ferromagnetic matrix
(d) None of the above

……...xxx…….

4. SEMICONDUCTOR MATERIALS

Position in Question Paper **Total Marks-12**

Q.1. a) 2-Marks.
Q.1. b) 2-Marks.
Q.2. a) 4-Marks.
Q.3. d) 4-Marks.

Descriptive Question

1. Sketchenergy band diagram of intrinsic semiconductor.(S-18)
2. Pentavalent impurity materials are called as Donor impurity.' Justify your
3. answer.(S-18)
4. Compare P-type semiconductor with N-type semiconductor on the basis of (i) Majority charge carrier (ii) Minority charge carrier (iii) Impurity material (iv) Fermi-level position in energy band diagram.(S-18)
5. Sketch energy band diagram of conducting and insulating material and label it
   i. well. .(S-18)
6. Explain thermal conductivity and coefficient of thermal conductivity in semiconductor material.(S-18)
7. Suggest two passive materials used for substrate. metal and capacitance of semiconductor device fabrication. State their two functions.(S-18)
8. Explain the formation of energy bands in solids**.**
9. State any four materials used in fabrication of semiconductor device and Describe its need.(W-18,w-19)
10. Define intrinsic and extrinsic semiconductor.(W-18)
11. State impurities for obtaining p-type and n-type semiconductor from
12. Intrinsic semiconductor (2 each)(W-18)
13. Sketch energy band diagram of intrinsic semiconductor.

MCQ Question

(Total number of Question=Marks*3=12*3=36)

Note: Correct answer is marked with **bold.**

•**Conductor:** The material which allow the current to the flow very easily is called as conductor.

•E.g- aluminum, copper or any metal etc.

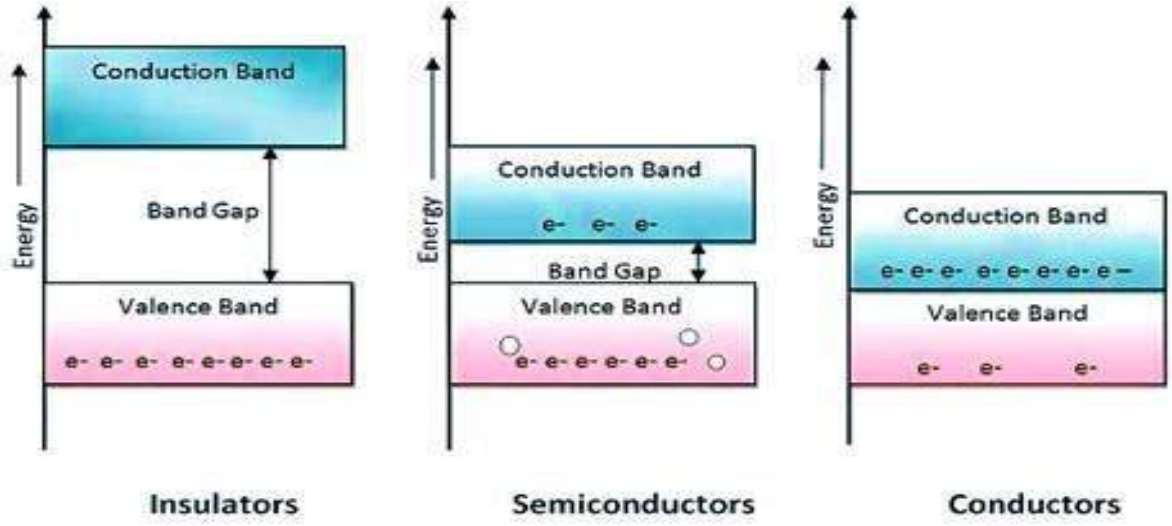
•**Semiconductor:** These materials are called semiconductor because their conductivity lies between that of a metal and insulators.

•E.g-Silicon and Germanium.

•**Insulators:** The material which does not allow the current is called as insulator.

•E.g- wood,glass,mica,paper etc

S.No	Conductors	Semiconductors	Insulators
1	Easily conducts the electrical current.	Conducts the electric current less than conductor and greater than insulator.	Does not conduct any current.
2	Has only one valence electron in its outermost orbit.	Has four valence electron in its outermost orbit.	Has eight valence electron in its outermost orbit.
3	Conductor formed using metallic bonding.	Semiconductors are formed due to covalent bonding.	Insulators are formed due to ionic bonding.
4	Valence and conduction bands are overlapped.	Valence and conduction bands are separated by forbidden energy gap of 1.1eV.	Valence and conduction bands are separated by forbidden energy gap of 6 to 10eV.
5	Resistance is very small	Resistance is high	Resistance is very high
6	It has positive temperature coefficient	It has negative temperature coefficient	It has negative temperature coefficient
7	Ex: copper,aluminium,etc	Ex: silicon, germanium, etc	Ex: Mica, Paper, etc



Q1.How does a semiconductor behave at absolute zero?
(a) Conductor
(c) Semiconductor
(b) Insulator
(d) Protection device

Q2. Semiconductor acts as an insulator in the presence of impurities.
(a) True
(b) False

Q3. How is the resistance of semiconductor classified?
(a) High resistance
(c) Negative temperature co-efficient
(b) Positive temperature co-efficient
(d) Low resistance

Q4. What are the charge carriers in semiconductors?
(a) Electrons and holes
(c) Holes
(b) Electrons
(d) Charges

Q5. Which of the following is known as indirect band gap semiconductors?
(a) Germanium
(c) Platinum
(b) Nickel
(d) Carbon

Q6.Which column elements are combined to make compound semiconductors?
(a) First and fourth
(c) Second and fourth
(b) Fifth and sixth
(d) Third and fifth

Q7. Compound semiconductors are also known as direct band gap semiconductors.
(a) True
(b) False

Q8. How are charge carriers produced in intrinsic semiconductors?
(a) By pure atoms
(c) By impure atoms
(b) By electrons
(d) By holes

Q9.What type of material is obtained when an intrinsic semiconductor is doped with pentavalent impurity?
(a) N-type semiconductor
(c) P-type semiconductor
(b) Extrinsic semiconductor
(d) Insulator

Q10. What type of material is obtained when an intrinsic semiconductor is doped with trivalent impurity?
(a) Extrinsic semiconductor
(b) Insulator
(c) N-type semiconductor
(d) P-type semiconductor

Q11. A semiconductor is formed by …… bonds.
(a)Covalent
(b)Electrovalent
(c)Co-ordinate
(d)None of the above

Q12. A semiconductor has …… temperature coefficient of resistance.
(a)Positive
(c)Negative
(b)Zero
(d)None of the above

Q13. A semiconductor has generally …… valence electrons.
(a)2
(c)6
(b)3
(d)4

Q14. When a pure semiconductor is heated, its resistance ……..
(a)Goes up
(c)Remains the same
(b)Goes down
(d)Can't say

Q15.When a pentavalent impurity is added to a pure semiconductor, it becomes ……
(a)An insulator
(c) p-type semiconductor
(b)An intrinsic semiconductor
(d) n-type semiconductor

Q16. Addition of pentavalent impurity to a semiconductor creates many ……..
(a)Free electrons
(c)Valence electrons
(b)Holes
(d)Bound electrons

Q17.Intrinsic semiconductors are those…….
(a)Which are made of semiconductor material in its purest form
(b)Which have zero energy gap
(c) Which have more electrons than holes
(d)Which are available locally

Q18.Intrinsic semiconductor at room temperature will have,..... available for conduction
(a).Electrons
(c)Both electrons and holes
(b).Holes
(d)None of the above

Q19.Semiconductor is formed by…….. Bonds
(a) Covalent
(c) Co-ordinate
(b) Electrovalent
(d) Ionic

Q20.Semiconductor has …….Temperature Coefficient of resistance
(a)Positive
(b) Zero
(c)Negative
(d) NOT

Q21.Barrier potential in silicon diode…….
(a) 0.72eV
(b) 1.12eV
(c)0.15eV
(d) 1.72eV

Q22.In the Hall Effect, the directions of electric field and magnetic field are parallel to each other.The above statement is

(a) True **(b) False**

Q23.Barrier potential in silicon diode……

(a) 0.72eV (b) 1.12Ev

(c)0.15eV (d) 1.72eV

Q24.Which of the following parameters can't be found with Hall Effect?

(a) Polarity (c) Carrier concentration

(b) Conductivity **(d) Area of the device**

Q25.In the Hall Effect, the electric field is in x direction and the velocity is in y direction. What is the direction of the magnetic field?

(a) X **(c) Z**

(b) Y (d) XY plane

Q26.What is the velocity when the electric field is 5V/m and the magnetic field is 5A/m?

(a) 1m/s (c) 0.2m/s

(b) 25m/s (d) 0.125m/s

Q27. Calculate the hall voltage when the Electric Field is 5V/m and height of the semiconductor is 2cm?

(a) 10V **(c) 0.1V**

(b) 1V (d) 0.01V

Classification of Semiconductor

•1) **Intrinsic Semiconductor:**

•It is defined as silicon and germanium in its purest form is called as intrinsic semiconductor.

Intrinsic Semiconductor:-

It is pure semi-conducting material and no impurity atoms are added to it. In the intrinsic semiconductor, number of free electrons in the conduction band and the number of holes invalence band is exactly equal and very small indeed.

•2) **Extrinsic Semiconductor:**

•It is defined as silicon and germanium in its impurest form is called as extrinsic semiconductor.

Extrinsic Semiconductor:-

It is prepared by doping a small quantity of impurity atoms to the pure semi conducting material. In the extrinsic Semiconductor, number of free electrons and holes is never equal.There is excess of electrons in n-type semi-conductors and excess of holes in p-type semi- conductors.

•Its devided into two parts;

•1. N-type semiconductor-pentavalent impurity

•2. P-type semiconductor- trivalent impurity

Intrinsic Semiconductor:

It is defined as silicon and germanium in its purest form is called as intrinsic semiconductor.

1.Number of electron is always equal to number of holes.

2. Conductivity is poor

3.Position of fermi level – At the centre of the forbidden gap.

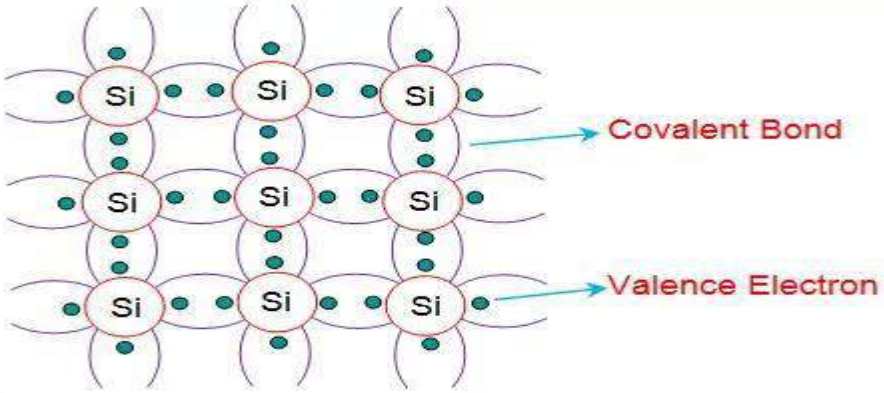


Figure 1 2-D Crystal Lattice of Silicon

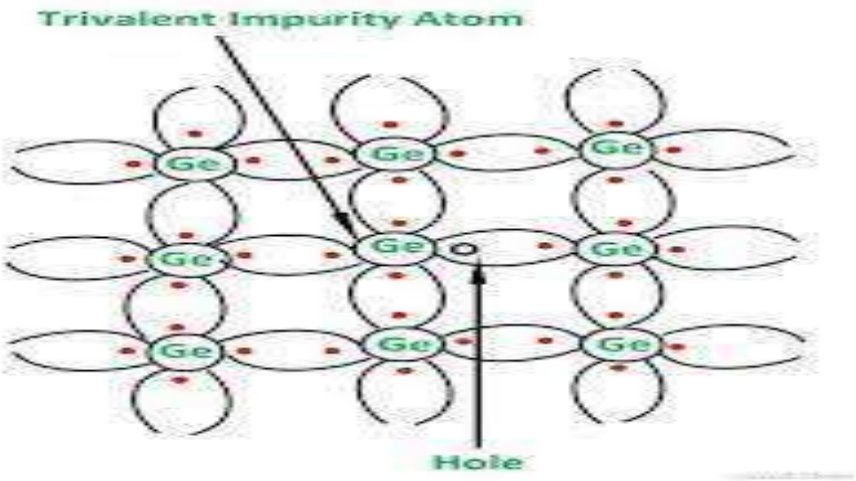
Extrinsic Semiconductors

It is defined as silicon and germanium in its impurest form is called as extrinsic semiconductor

1.They are never equal to each other.

2.Conductivity is much higher.

3.Position of fermi level- It is either near the conduction band or near valance band.



Q28. Calculate the Hall Effect coefficient when number of electrons in a semiconductor is 10^{20}.

(a) 0.625 (c) 6.25

(b) 0.0625 (d) 62.5

Q29. In Hall Effect, the electric field applied is perpendicular to both current and magnetic field?

(a) True

(b) False

Q30. At what temperature the donor states are completely ionized?

(a) 0 K (c) 300K

(b) ROOM (d) 900K

•1. N-type semiconductor-pentavalent impurity

•2. P-type semiconductor- trivalent impurity

There are two types of impurities added in a intrinsic semiconductor which are as follows

1.Donor Impurity

2.Acceptor Impurity

1.Donor Impurity –

- These are pentavalent which means they have five valence electron.
- Four valence electron out of five elctrons are utilized to form four covalent bondwith Silicon or Germanium.
- Fifth valence electron thus enter the conduction band very easily,thus this impurityare also called as donor impurity while doping is called as donor doping.
- It is used to manufacture N-type semiconductor
- Eg:Arsenic,Phosphorus,Antimony

2.Acceptor Impurity

- These are Trivalent which means they have three valence electron.
- All the three elctrons are utilized to form three covalent bond with Silicon or Germanium.
- Thus fourth covalent bond remains incompelete resulting in a vacancy called as hole.this hole act as a positive charge carrier,thus this impurity are also called as Acceptor impurity while doping is called as Acceptor doping.
- It is used to manufacture P-type semiconductor

Eg:Boron,Gallium,Indium

Q31. Which of the following band is just above the intrinsic Fermi level for n-type semiconductor?

(a) Donor band (b) Valence band

(c) Acceptor band
(d) Conduction band

Q32. At absolute zero temperature, which level is above the Fermi energy level in the case of donors?
(a) Donor energy level
(c) Conduction Band
(b) Acceptor energy level
(d) Valence Band

Q33. At absolute zero temperature, which level is below the Fermi energy level in the case of acceptors?
(a) Donor energy level
(c) Conduction band
(b) Valence Band
(d) Acceptor energy level

Q34.In diffusion, the particles flow from a region of _____ to region of _____
(a) High, low
(b) Low , high
(c) High , medium
(d) Low, medium

Q35.Which of the following parameter describes the best movement of the electrons inside a semiconductor?
(a) Velocity gradient
(c) Mobility
(b) Diffusion
(d) Density gradient

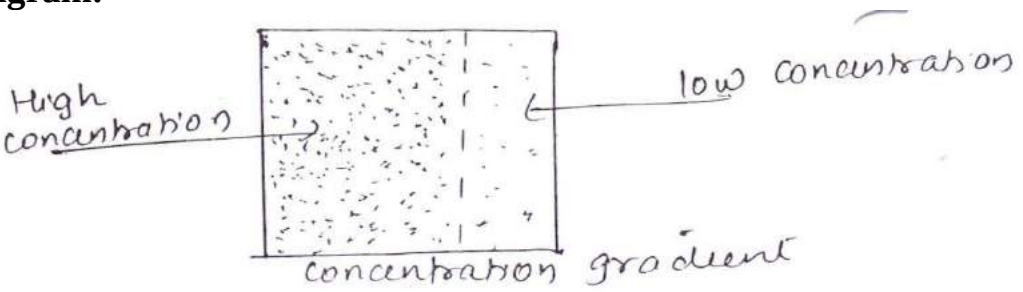
Q36.The knee voltage of a diode approximately is equal to the……..
(a)Breakdown voltage
(b)Barrier potential
(c)Applied voltage
(d)Forward voltag

Explain the following in brief:

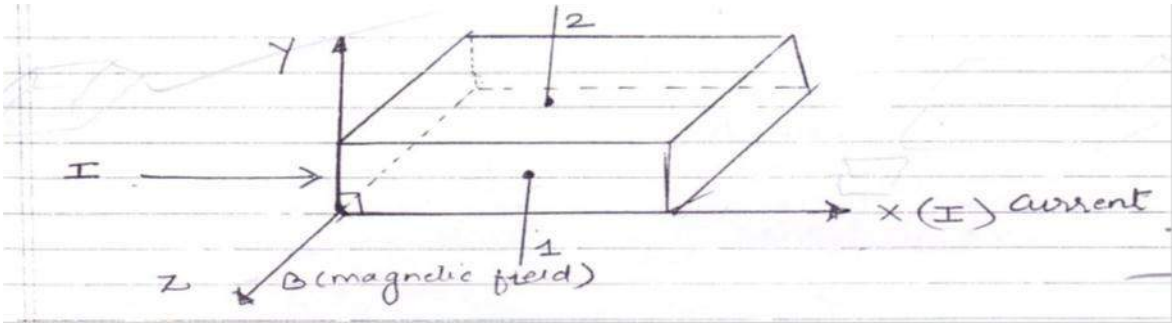
(i) Diffusion
(ii) Hall effect
(iii) Thermal conductivity

Diffusion: In a semiconductor bar a concentration gradient exist when either number of electrons or holes is greater in one region of a semiconductor as compared to other region.
When such concentration gradient exist, the carriers (electrons/holes) move from the region of higher concentration to lower concentration this process is called as diffusion.

Diagram:



Hall Effect: If a piece of metal or semiconductor carrying current "I" is placed in a transverse magnetic field „B" then an electric field „E" is induced in the direction Perpendicular to both I and B.
Hall effect is used to determine whether a semiconductor is N type or P type, and to find carrier concentration.



Thermal conductivity:-
Thermal conductivity (often denoted k, λ, or κ) is the property of a material to conduct heat. It is evaluated primarily in terms of the Fourier's Law for heat conduction. In general, thermal conductivity is a tensor property, expressing the anisotropy of the property.

Heat transfer occurs at a lower rate in materials of low thermal conductivity than in materials of high thermal conductivity. Correspondingly, materials of high thermal conductivity are widely used in heat sink applications and materials of low thermal conductivity are used as thermal insulation. The thermal conductivity of a material may depend on temperature.

- **Explain the following materials used for fabrication of semiconductors:**

1. **Substrate:**
   - It is used for deposition of thin film layers, Substrate can be plastic, glass or ceramic.
   - Plastic substrate are used only for thin film solar cells, Glass or Ceramic arehigh temperature substrates. They are used for deposition of metals for resistors and capacitors.
2. **Metals:**
   - The fabrication of the passive part of integrated silicon and thin film circuits involves use of different metals.
   - The metals usually act as capacitor plate, as heat dissipater as a mechanical support
3. **Capacitance Material:**
   - They should have high dielectric constant, pin-hole free continuous layer, ability to withstand thermal stress,
   - Commonly used capacitance material are SiO, ZnS, SiO_2.
4. **Junction coating:**
   - The junction protected by using resins as coating material are called junction coating.
   - The material generally used are high purity silicon resin and silicon modified polyester resin, because of the satisfactory performance and long life.
5. **Device potting:**
   - It is process of filling a complete electronic device with Gelatinous compoundfor resistance of shock and vibrations, exclusion of moisture and corrosive agents Silicon fluids dielectric gels and flexible potting resins are some of the potting materials
6. **Packaging:**
   - A suitable enclosure or packaging is needed for ensure safety of solid state

devices.

- Metal cans and sealed glass containers satisfy the extreme requirements of space and military users.

Q37. The potential barrier existing across a PN junction…….

(a)Neutralizes doped impurities with semiconductor material forming neutral compound

(b)Prevents total recombination of holes and electrons

(c)Facilitates combination of holes and electrons

(d)None of the above

Q38. The donor impurity must have only.....valence electrons

(a).Two

(b)Three

(c)Four

(d)Five

Q39. An electron in the conduction band…….

(a)Is always chargeless

(b)Has tendency to leave the atom

(c)Has to lower emergency than an electron in the valence band

(d)Has higher energy than an electron in the valence band

Q40. It is easy to break the covalent bond by thermal energy in case of.....

(a)Carbon

(b)Germanium

(c)Silicon

(d) None of the these.

----------XXX----------

5. MICROELECTRONIC COMPONENTS AND SPECIAL MATERIALS.

Position in Question Paper **Total Marks-08**

Q.1. a) 2-Marks.
Q.2. b) 2-Marks.
Q.3. c) 4-Marks.
Q.4. c) 6-Marks.
Q.6. d) 6-Marks.

Descriptive Question

1. State any four applications of micrometers. (S-19)
2. Give various photoemissive materials and suggest relevant combination of material for LED to emit Yellow and Green colour. (S-19)
3. Suggest the relevant materials used in flexible and wearable antenna. (S-19)
4. Give the material composition for obtaining RED and yellow colour LED. (S-19)
5. State the materials used for fabrication of photo diode along with its Justification.(S-19)
6. Describe the process of photo emission. State the application of photo emission In electronic components. (S-19)
7. Explain the materials used in wearable antennas with their properties. (S-19)
8. Define photo emissive material.
9. List the different impurities used to emit different colours of light.
10. Give various photoemissive materials and suggest relevant combination of material for LED to emit Yellow and Green colour.
11. List different impurities used for different wavelengths.
12. State the working principle of electroluminescence
13. List out application of LED
14. Give the materials used for Green, Yellow and Red LEDs
15. Give the functions of junction LASER
16. Give the material used for flexible antenna.
17. Give the material used for wearable antenna.

MCQ Question

(Total number of Question=Marks*3=08*3=24)

Note: Correct answer is marked with **bold.**

Give the material composition for obtaining RED and yellow colour LED.

For RED colour materials are:

Aluminum gallium arsenide (AlGaAs)Gallium arsenide phosphide (GaAsP)
Aluminum gallium indium phosphide (AlGaInP)Gallium phosphide (GaP)

For yellow colour materials are:

Gallium arsenide phosphide (GaAsP)
Aluminium gallium indium phosphide (AlGaInP)Gallium phosphide (GaP)

- **Process of Photoemission**:

when light of appropriate frequency and intensity is incident upona surface of certain materials,the energy of light is given to electrons to leave the surface of metal this phenomenon is known as photoemission.

- **Application of photo emission in electronic components:**

photoemission are used in photo cathode which are widely used in automation and for remote control of industrial process.

- **Photoemissive cells or photo tubes are used** in door openers,counters, position andtemperature control and colour analysis

Q1. Commonly used photoemissive material is _____

(a)gold
(b)tellurium
(c)opium
(d)cesium-antimony

Q2. A light emitting diode is _____

(a) Heavily doped
(b) Lightly doped
(c) Intrinsic semiconductor
(d) Zener diode

Q3.Which of the following materials can be used to produce infrared LED.

(a) Si
(b) GaAs
(c) CdS
(d) PbS

Q4. The reverse breakdown voltage of LED is very low.

(a) True

(b) False

Q5. What should be the band gap of the semiconductors to be used as LED?

(a) 0.5 eV

(b) 1 eV

(c) 1.5 eV

(d) 1.8 eV

Q6.What should be the biasing of the LED?

(a) Forward bias

(b) Reverse bias

(c) Forward bias than Reverse bias

(d) No biasing required

Q7. Which process of the Electron-hole pair is responsible for emitting of light?

(a) Generation

(b) Movement

(c) Recombination

(d) Diffusion

Q8.What is the bandwidth of the emitted light in an LED.

(a) 1 nm to 10 nm

(b) 10 nm to 50 nm

(c) 50 nm to 100 nm

(d) 100 nm to 500 nm

Q9.Which of the following is not a characteristic of LED

(a) Fast action

(b) High Warm-up time

(c) Low operational voltage

(d) Long life

Q10. In the dynamic response of Injection Laser Diode (ILD), the delay which is followed by ____ frequency damped oscillations give rise to the generation of relaxation oscillations.

(a) Low

(b) Medium

(c)High

(d**)** All of the above

Q11.Which among the following characteristics of Laser light specifies the precise movement of all individual light waves together through time and space?

(a)Monochromatic

(b) Directional

(c) Coherent

(d) Brightness

Q12. In a laser structure, the existence of standing waves is possible at frequencies for which the distance between the mirrors is an integral number of _____

(a) λ / 2

(b) λ / 4

(c) λ / 6

(d) λ / 8

Q13. Which among the following is a key process adopted for the laser beam formation as it undergoes the light amplification?

(a) Spontaneous Emission

(b) Stimulated Emission

(c) Both a and b

Q14.The nano materials are used in the light emitted electro luminescence devices.

(a) True

(b) False.

Q15.The synthesized magnetic nano particles from _____ have been found to self-arrange automatically.

(a) Zinc
(c) Iron
(b) Copper
(d) Zirconide

- **Explain the materials used in wearable antennas with their properties.**

The Substrate:

The fabric textile material to be used should have more dielectric permittivity.

- Low dielectric constant
- Nominal thickness value.
- Low moisture content of fabric.

Eg. 100% pure cotton / polyamide space fabric.

Conducting material having low and stable electrical resistance, flexible in nature eg.: Copper, Nickel

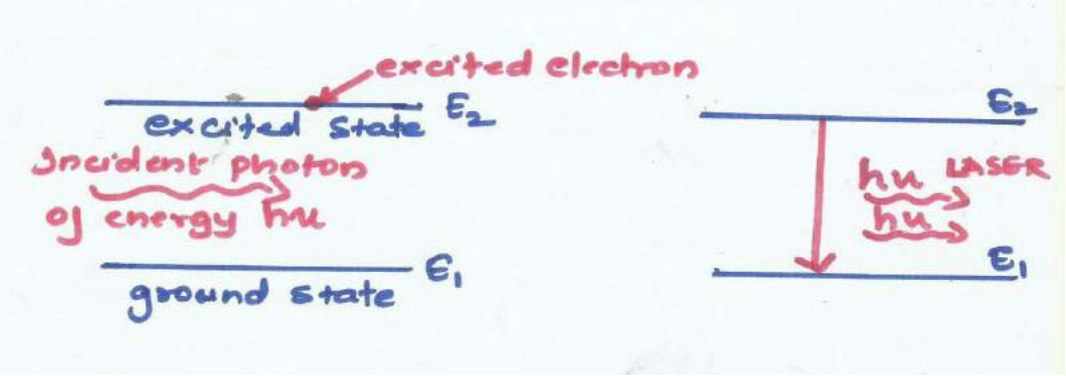
- **Give any two applications of micro-relays.**

Relays are used in a wide variety of **applications** throughout industry, such as in telephone exchanges, digital computers and automation systems.
They are also used in electrical fuel pump.

- **Explain the principle of stimulated emission and radiation in LASER.**

Principle of stimulated emission:

- When a photon of energy hμ is incident on an atom (electron), then the electron gets excited and moves from lower energy level E1 to higher energy level E2.
- After completion of life time, the excited electron comes to lower energy level emitting a photon this is known as spontaneous emission.
- But when before completing the life time of excited electron ,if the electron is triggered due to an action of incident photon.
- The interaction between excited electron and incident photon can trigger the excited electron to make a transition to ground state.
- This transition generates another photon which is identical to incident photon.



This process of forced emission of photons due to incident photon is called as stimulatedemission and radiation.

- **Suggest the relevant materials used in flexible and wearable antenna.**
- **The Substrate**:
  - The fabric textile material to be used should have more dielectric permittivity
  - Low dielectric constant.
  - Nominal thickness value.
  - Low moisture content of fabric.
  - **Example**: 100% pure cotton / polyamide space fabric.
- **Conducting material** having low and stable electrical resistance, flexible in nature **Example**: Copper, Nickel.

Q16.The nano particles from iron and palladium are used to produce _____

(a) Magnets
(c) Magneto meters
(b) Magnetic lens
(d) Magnetic storage devices

Q.17.Nano particles target the rare _____ causing cells and remove them from blood.

(a) Tumour
(c) Infection
(b) Fever
(d) Cold

Q18._____ is the field in which the nano particles are used with silica coated iron oxide iron oxide.

(a) Magnetic applications
(b) Electronics
(c) Medical diagnosis
(d) Structural and mechanical materials

Q19. The _____ to the ceramics are superior coatings.

(a) Nano particles
(c) Nano crystals coating
(b) Nano powder
(d) Nano gel

Q20. _____ of ceramic components are easier through nano structuring**.**

(a) Lubrication
(b) Coating
(**c) Fabrication**
(d) Wear

Q21. By nano scale distribution of the _____ in matrix improves the life and performance.
(a) Carbide
(**b) Tungsten**
(c) Hydrides
(d) Nitrites

Q22. When the source of light is not sun light then the photo voltaic cell is used as _____

(a) Photo diode
(b) Photo voltaic cell
(**c) Photo detector**
(d) Photo transmitte.

Q23. The amount of photo generated current increases slightly with an increase in _____
(**a) Temperature**
(b) Photons
(c) Diode current
(d) Shunt current

Q24. _____ photo voltaic devices in the form of thin films.
(**a) Cadmium Telluroide**
(b) Cadmium oxide
(c) Cadmium sulphide
(d) Cadmium sulphate

Q25.Top loading is used in an antenna in order to increase its _____.
(**a)Bandwidth**
(b) Beamwidth
(c) Input capacitance
(d)None of these

Q26.A universal motor is one which…….
(a) is available universally
(b) can be marked internationally
(**c)can be operated either on de or ac supply**
(d)runs at dangerously high speed on no-load

Q27. Which of the following motor is an interesting example of beneficially utilizing a phenomenon that is often considered undesirable?
(**a) hysteresis motor**
(b)reluctance motor
(c)stepper motor
(d)shaded-pole motor

Q28.Which one of these is not a manually operated switch?
(a)Thumbwheel switch
(b)Rotary selector switch
(c)**Crossbar switch**
(d)Toggle switch

Q29.A switch should have……
(**a) High insulation resistance**
(b) Low insulation resistance
(c) Insulation resistance equal to contact resistance
(d) None of the above

- **State any four applications of micrometers.**
- It is used to measure the teeth of gears accurately.
- This instrument is used to check round work pieces accurately
- It is also used to check wall thickness of the pipes
- It is used to check depth or height of the work piece

- It is used to measure groves keyways etc
- It is used to check inside bore of the work piece accurately
  It is used in telescopes or microscopes to measure the apparent diameter of celestialbodies or microscopic objects.

- **Give various photoemissive materials and suggest relevant combination of materialfor LED to emit Yellow and Green colour.**
  Various photoemmisive materials are as follows

  - Zinc
  - Potassium
  - Lead sulphate
  - Sodium
  - Cadmium sulphide

Relevant combination of material for LED to emit Yellow colour

1. Gallium Phosphide(GaP)
2. Aluminum Gallium Indium Phosphide
3. Gallium Arsenide Phosphide

Relevant combination of material for LED to emit Green colour

1. Gallium Phosphide(GaP)
2. Aluminum Gallium Indium Phosphide

Aluminum Gallium Phosphide.

Q30.The primary function of a fuse is to…….
(a)Open the circuit
(b)Protect the appliance
(c)Protect the line
(**d)Prevent excessive currents from flow through the circuit**

Q31. A relay is used to……..
(a) Break the fault current
(b) Sense the fault
(**c) Sense the fault and direct to trip the circuit breaker**
(d) All of these

Q32. ……..is a very small particle, measured in microns, that can move themselves.
(**a) Micro-motor**
(b) Micro- Relays
(c) Micro Switch
(d) All of these

Q33. Photo –Voltaic Materials……

(a) Silicon
(b) Cadmium oxide
(c) Selenide oxide
(**d) All of these**

Q34. A photo device which convert light energy into electrical energy is called……
a) Photo –Voltaic cell
b) Laser
c) Nano materials
d) All of these

Q35. Types of Biofuels……
(a) Ethanol
(b) Biodiesel
(c) Bioalcoholes
(d) Biogas
(**e) All of these**

Q36.Laser long form……
(**a) Light Amplification by Stimulated Emission of Radiation.**
(b) Light Amplification by Stimulated Emission of Reflection
(c) Light Amplification by Spontaneous Emission of Reflection
(d) None of these.

Q37. An electrical switch that is actuated by very little physical force, through the use of topping point mechanism is called……
(**a) Micro-Switch**
(b) Micro Relay
(c) Micro-motor
(d) Biogas

Q38.An electrical switch that is actuated by very little physical force,through the use of topping point mechanism is called……
(**a) Micro-Switch**
(b) Micro Relay
(c) Micro-motor
(d) Biogas

Q39.Example of Photo- Electroluminescence materials ……
(a) Phosphor
(**b) Zinc Sulphide**
(c) Silicon Carbide.
(d) None of these.

Q40.AlGaAs……..
(**a) Aluminium gallium arsenide**
(b) Gallium arsenide
(c) Aluminium Silicon Carbide.
(d) None of these.

……xxx……