Q. P. Code: 20520

Time 3Hrs **Marks :100**

N.B : (1) All questions are compulsory.
(2) Figures to the right indicate maximum marks.
(3) Use of non-programmable calculators is permitted.
(4) Symbols used have their usual meaning

Q1. A) Select the correct option **(12)**

1) A single optical fiber have the core and the cladding refractive indices of 1.5 and 1.4 respectively. The critical angle of the fiber is_____
a) 68.96^0 b) 46.23^0 c) 34.54^0 d) none of these

2) The process of achieving greater population of higher energy state as compared to lower energy stateis known as_____
a) Stimulated emission b) Population inversion c) Induced absorption d) none of these

3) _____ is movement of particle of matter due to its own kinetic energy from region of higher concentration to the region of lower concentration.
a) osmosis b) surface tension c) viscosity d) Diffusion

4) _____is pressure in atmosphere which is needed in opposite direction to stop the entry of solvent from dilute solution to concentrated solution.
a) diffusion pressure b) surface pressure c) pressure d) osmotic pressure

5) Which of the following statement is wrong about a semiconductor?

a) There are no free electrons at 0 K.
b) There are no free electrons at any temperature.
c) The number of free electrons increases with temperature.
d) The number of free electrons is less than that in a conductor.

6) The susceptibility of paramagnetic material is _____

a) positive and small b) positive and large c) negative d) zero

Q1. B) Answer in one sentence **(03)**

1) Define sound absorption coefficient of a material.
2) State any two uses of LASER?
3) Define magnetic flux density.

Q1. C) Fill in the Blank **(05)**

1) A communication technology that uses glass or plastic fibers to transmit data or information in the form of light pulsesis called_____.
2) LASER stands for Light Amplification by _____ emission of radiation.
3) Golgi apparatus participates in cell wall formation and secretion. This statement is _____ (True/false)

4) In _____semiconductor, the impurity added to an intrinsic semiconductor is trivalent.

5) The unit of magnetic induction is _____

Q2. A) Attempt any one **(08)**

1) What is Holography? Explain the construction and reconstruction of hologram with neat diagrams.

2) Explain the following factors affecting the acoustic quality of building.
a) Reverberation time b) Echelon effect c) Focusing

Q2. B) Attempt any one **(08)**

1) Explain the principle of optical fiber. Write its applications in communication and medicine.

2) With a neat energy level diagram explain the construction and working of He-Ne LASER.

Q2. C) Attempt any one **(04)**

1) For an empty assembly hall of size 20 × 15 × 10 cubic meter with total surface area 1300 m^2 and average absorption coefficient 0.106. Calculate reverberation time.

2) The silica optical fiber with a core refractive index of 1.50 and a cladding refractive index of 1.47. Determine critical angle at core-cladding interface and numerical aperture of the fiber in air. [refractive index for air (n_0) = 1]

Q.3 A) Attempt any one **(08)**

1) Explain **Action potential** and its propagation in cells/neurons.
2) What is **viscosity**? Give its units. Explain any one method to determine viscosity and factors effecting viscosity.

Q.3 B) Attempt any one **(08)**

1) Explain **Osmosis** and show how it is different from Diffusion. What is Osmotic pressure?
2) Explain **surface tension** based on molecular theory. Discuss factor effecting surface tension.

Q.3 C) Attempt any one **(04)**

1) Draw neat diagram and explain Electrical Properties of Cell.
2) Draw neat diagram and explain Prokaryotic Cell.

Q.4 A) Attempt any ONE **(08)**

1) With the help of energy band diagram, explain how materials are classified as conductors, insulators and semiconductors.

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2) Write a note on: a) Diamagnetic materials b) Paramagnetic materials

Q.4 B) Attempt any ONE **(08)**

1) Write a note on : a) Metals and alloys b) Ceramics c) Polymers d) Composites.
2) Explain hysteresis curve of ferromagnetic materials on the basis of domain theory.

Q.4 C) Attempt any ONE **(04)**

1) Find the relative permeability of ferromagnetic material if a magnetic field of strength 220 A/m produces magnetization of 3300 A/m in it.
2) A metal wire has a resistance of 2.52 Ω at 0°C. If its temperature coefficient of resistance is 3.8×10^{-3} / °C, find the resistance of wire at 55°C.

Q.5 Attempt any Four **(20)**

1) Explain the following properties of LASER light in brief. a)intensity b) directionality
2) A step index fiber hasa numerical aperture of 0.26, a core refractive index of 1.5 and core diameter of 100 μm. Calculate the refractive index of cladding and acceptance angle of the fiber in air.
3) Explain Diffusion mechanism and factors affecting rate of Diffusion.
4) Distinguish between Osmosis and Diffusion
5) Give the applications of liquid crystal display.
6) Write a note on dielectric materials.

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