Q. P. Code: 20518

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 correct answer **(12)**

1) If the core and the cladding of an optical fiber have refractive indices 1.5 and 1.47 respectively then the critical angle for core/ cladding interface is _____

a) $87^0 30'$ b) $78^0 30'$ c) $68^0 30'$ d) None of these.

2) If a laser of wavelength λ passes through an aperture of width d, then a laser travels parallel for a distance of about d^2/λ. Beyond this, beam begins to spread with the distance and the angular spread $\Delta\theta$ is _____

a) λ/d b) λ^2/d c) λ/d^2 d) None of these.

3) The cell capacitance is the_____ due to plasma membrane acting as capacitor.

a) resistance b) voltage c) liquid capacitance d) membrane capacitance

4) The cohesion in a liquid tends to prevent escape of liquid from surface. This results in _____.

a) diffusion b) surface pressure c) surface viscosity d) surface tension

5) Superconductors having T_c above _____ (boiling point of liquid nitrogen) are technologically interesting because they do not require liquid Helium or liquid Hydrogen for cooling.

a)77K b)50K c)20K d)4K

6) The full form of LED is _____

a)Light emitting diode b)Laser emitting diode
c)Light emitting display d)Laser emitting display

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

1) State Fick's first law .
2) What is meant by acoustics?
3) State the Matthiessen's rule

Q. P. Code: 20518

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

1) When the sound waves produced in a hall superpose with each other the _____ are produced.
2) Light emitted by a laser is sharp and has a spread of the order of _____
3) Osmosis is a phenomenon whereby a stronger solution is separated from a weaker one by a _____ membrane.
4) In _____ materials magnetic susceptibility is negative.
5) When light refracts through glass it obeys _____ law.

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

1) Explain some factors affecting the acoustics of building.
2) Explain step index and graded index optical fiber.

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

1) What is holography? Explain construction and reconstruction of hologram.
2) Explain any three uses of laser.

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

1) A laser beam of wavelength 6000 Å is focused by means of a mirror of diameter 3m on a certain object at a distance of 5×10^6m. Find the real spread of the spot.
2) Calculate numerical aperture of a step index fiber for an optical fiber that have a core of refractive index 1.5 and cladding of refractive index 1.48. Also determine the critical angle for cladding core interface.

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

1) Explain in detail action potential of a cell and the method of measuring action Potential.
2) Explain one method to measure viscosity.

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

1) Write note on cell potential and cell impedance.
2) Describe the process of dialysis of blood.

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

1) What is cell capacitance? Explain methods to calculate it.
2) Describe molecular theory to explain surface tension.

Q. P. Code: 20518

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

1) Write Short notes on:
   a) Paramagnetism
   b) Ferromagnetism

2) Explain the classification of materials on the basis of their structure.

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

1) Explain conductors, semiconductors and insulators on the basis of the energy band diagram.
2) Describe the different chemical methods to synthesize nanomaterials.

Q4 C) Attempt any one **(04)**

1) Explain the applications of magnetic materials in recording and storage.
2) Explain polymers and composites.

Q5. Attempt any Four **(20)**

1) Define absorption coefficient of a material. Determine relation between absorption coefficient and reverberation time.
2) Explain the terms- Population inversion, pumping and active medium.
3) Distinguish between osmosis and diffusion.
4) Explain Diffusion mechanism and factors affecting rate of Diffusion.
5) Explain how the optical materials are useful in day to day life.
6) Write a short note on nanomaterials.

****