Time : 3 Hours **[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 The reverberation time for speech is about _____ seconds
a) 1 to 2 b) 2 to 2.5 c) 3 to 4 d) 4 to 5

2 For core and cladding refractive index of 1.6 and 1.5, the numerical aperture value is _____
a) 0.56 b) 0.24 c) 0.64 d) 0.75

3 Dialysis is a process that duplicates ____ function.
a) liver b) intestine c) kidney d) pancreas

4 Total amount of fluid in the human body is approximately ____ of body weight.
a) 60 % b) 70 % c) 80 % d) 50 %

5 Communication through Optical fiber is by ____
a) Photons b) Phonons c) Electrons d) Holes

6 Smallest unit of energy
a) joule b) ergs c) eV d) None

B) Answer in one sentence (03)

1 What is dead effect in acoustics?
2 What is viscosity?
3 Define critical temperature with reference to superconductor.

C) Fill in the Blanks (5)

1 The wavelength of light emitted from He – Ne laser is approximately ___
2 A cell is ____ system that is able to maintain its structure and reproduce.
3 ____ is the net movement of molecules or atoms from a region of high concentration to a region of low concentration.
4 Property of developing voltage when pressure is applied _____
5 Property of inducing magnetic field opposite to the applied magnetic fields_____

Q2. A) Attempt **any one** (8)

1 Write a short note on:
(a) Step index optical fiber
(b) Graded index optical fiber

2 State any eight applications of optical fibers.

B) Attempt **any one** (8)

1 Explain the basic principle of a laser with the help of a diagram.
2 Explain the following properties of laser:
(a) Coherence
(b) Directionality

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C) Attempt **any one** (4)

1 A hall has a volume of 2250 m^3. Its total absorption is equivalent to 100 m^2 of open window. What will be the effect on the reverberation time if audience fills the hall and thereby increase the absorption by another 100 m^2?

2 A hall of volume 5500 $metre^3$ is found to have a reverberation time of 2.3s. The sound absorbing surface of the hall has an area of 750 m^2. Calculate the average absorption coefficient.

Q3. A) Attempt **any one** (8)

1 Discuss the biological aspects of osmosis and diffusion.

2 Explain voltage clamp technique to measure ion currents through the membranes of excitable cells.

B) Attempt **any one** (8)

1 What is action potential? Discuss types of action potential and explain characteristic of action potential.

2 State and explain Fick's laws of diffusion.

C) Attempt **any one** (4)

1 Determine the resting potential across the cell membrane given that concentrations of K^+ (inside 400 mM, outside 10 mM) of Na^+ (inside 50mM, outside 460 mM) and of Cl^- (inside 40 mM, outside 540mM) and the respective permiabilities of K^+, Na^+ and Cl^- are 1, 15 and 0.1.

2 Explain Hodgkin-Huxley model of action potential.

Q4. A) Attempt **any one** (8)

1 Mention any four important characteristics of nano-materials & any two applications.

2 Mention any four important characteristics of dielectric materials & any two applications.

B) Attempt **any one** (8)

1 Mention any four important characteristics of alloys & two applications.

2 Mention any four important characteristics of insulating materials & any two applications.

C) Attempt **any one** (4)

1 Compare Paramagnetic & Diamagnetic substances.

2 Compare Dielectric & Ferroelectric substances.

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Q5. (20)

Attempt **any Four**

1 Define sound absorption coefficient. Explain the method used to determine sound absorption coefficient.

2 State any five requirements of a good auditorium.

3 What are Prokryotic and Eukaryotic cells.

4 Explain membrane potential. What are resting and action potentials?

5 Define Pyroelectric effect & mention any one application.

6 Define piezoelectric effect & mention any one application.

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