

2022-26

Full Marks : 100

Time : 3 Hours

Candidates are required to give their answer in their own words as far as practicable. Their figures in the margin indicate full marks.

Group-A carries vary short answer type compulsory questions (Questions-1) and short answer type questions (Question-2 & 3). **Group-B** consists of descriptive questions. Answer sub-part (if any) of a questions at one place.

Group - A**(Very Short Answer Type Questions)**

1. Answer all the questions : $10 \times 1 = 10$
- (i) Divergence of position vector
 $\text{div} \vec{r} = \dots\dots\dots$

- (ii) An example of motion involving both translation and rotation is
- (iii) Relation between vectors \vec{E} , \vec{p} and \vec{D} is given by
- (iv) Young's double slit expt. is an example of division of (amplitude/wavefront)
- (v) Expression for work done during an adiabatic process, in terms of pressure and volume, is
- (vi) De Broglie wavelength relation is given as
- (vii) p and n type semiconductors are an example of semiconductor.
- (viii) Write the RHS of the De Margan's Theorem $\overline{A+B} = \dots\dots\dots$
- (ix) Position-momentum Uncertainty relation is given by
- (x) There are fundamental forces in nature.

2. What do you mean by gradient of a scalar field and divergence & curl of a vector field ? 5
3. Explain different elastic constants and write the interrelation between them. 5

Group - B

Answer any **four** questions : 20×4=80

4. What do you mean by thermal equilibrium ? Explain and differentiate the Zeroth, First, Second and Third Law of Thermodynamics.
5. State postulates of special theory of Relativity. Discuss Galilean transformation and Lorentz transformation.
6. Describe basic logic gates. Explain how NAND gate and NOR gate behave as Universal gate.
7. Express, with appropriate diagram and suitable examples, your understanding of interference, diffraction and polarization of light.

8. (a) Discuss electric field lines, electric flux and Gauss law in electrostatics.

(b) Explain magnetic field \vec{B} , magnetic intensity \vec{H} and magnetization vector \vec{M} and write the relation between them.

9. Describe your basic understanding of radioactivity, mean life, half-life and nuclear fission and fusion.
