

Mechanics and Optics (Major-2)

Time: 2:00 Hours

Marks: 50

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Que.1 Answer the following question (any two). (10)

- (1) Explain conservative and non-conservative force.
- (2) Explain linear momentum and its conservation principle.
- (3) Prove that $\tau = I\alpha$.

Que.2 Answer the following question (any two). (10)

- (1) Explain Galilean transformation.
- (2) Describe length contraction.
- (3) Write a short note on time dilation.

Que.3 Answer the following question (any two). (10)

- (1) Write a short note on plain diffraction grating.
- (2) Give the theory of Fraunhofer diffraction at double slit.
- (3) Explain zone plate.

Que.4 Answer the following question (any five). (10)

- (1) State Newton's laws of motion.
- (2) Explain potential energy.
- (3) Describe angular velocity.
- (4) Explain ether hypothesis.
- (5) Write and explain Einstein's postulates of special theory of relativity.
- (6) A certain process requires 10^{-8} sec to occur in an atom at rest in laboratory. How much will this process required to an observer in laboratory, when the atom is moving with a speed of 6×10^7 m/s.
- (7) Discuss types of diffraction.
- (8) Compare the zone plate and convex lens.
- (9) What is the radius at the first half period zone in a zone plate behaving like a convex lens of focal length 70 cm for light of wavelength $7000 \text{ \AA}$.

Que.5 Answer the following question (any two). (10)

- (1) State and prove work energy theorem.
- (2) Deduce Einstein mass-energy relation $E = mc^2$.
- (3) Explain action of zone plate.
