2. For a rotating frame, prove that the rate of change of a vector is equal to the rate of growth plus the rate of transport.

3. What is Jacobian elliptic function ? State its properties.

4. Explain Ferel's law.

5. Explain the Eulerian angles and find an expression for the angular velocity.

6. Describe the spinning top.

7. Explain the classification of dynamical systems.

8. Explain Lagrange's equation for impulsive motion.

9. State the postulates of special theory of relativity.

10. Derive the mass - energy equivalence.

SECTION - B (3 × 20 = 60)

Answer any THREE questions.
Each question carries TWENTY marks.

11. (a) State and prove the principle of conservation of energy.

(b) Derive the expression for the angular momentum of a rigid body.

12. (a) Discuss the motion of a simple pendulum.

(b) Find the equation of motion of a charged particle in uniform electric and magnetic fields which are perpendicular to each other.

13. (a) Discuss the motion of a rolling disk.

(b) Discuss the motion of a billiard ball.

14. (a) Establish Lagrange's equations of motion of a particle in a plane.

(b) State and prove Hamilton's principle.

15. (a) Explain the concept of Lorentz contraction.

(b) Explain 'time dilation'.