

**Comprehensive Test Series-04**  
**(Application of Derivatives)**

**XII**

**TIME: 1hr.**

**MM: 30**

**General Instructions:**

- All Questions are compulsory.
  - Use of calculator is not permitted.
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- Q.1 The two equal sides of an isosceles triangle with fixed base  $b$  are decreasing at the rate of  $3\text{cm/sec}$ . How fast is the area decreasing when two equal sides are equal to the base?
- Q.2 The volume of a cube is increasing at the rate of  $8\text{cm}^3/\text{sec}$ . How fast is the surface area increasing when the length of an edge is  $12\text{cm}$ ?
- Q.3 A man of height 2 meters walks at a uniform speed of 5 kilometers/hour away from a lamp post which is 6 meters high. Find the rate at which the length of his shadow increases.
- Q.4 A water tank has the shape of an inverted right circular cone with its axis vertical and vertex lowermost. Its semi-vertical angle is  $\tan^{-1}(0.5)$ . Water is poured into it at a constant rate of 5 cubic per minute. Find the rate at which the level of the water is rising at the instant when the depth of water in the tank is  $10\text{m}$ .
- Q.5 Water is leaking from a conical funnel at rate of  $5\text{cm}^3/\text{sec}$ . If the radius of the base of the funnel is  $10\text{cm}$  and its height is  $20\text{cm}$ , find the rate at which the water level is dropping when it is  $5\text{cm}$  from the top.
- Q.6 A man is walking at the rate of  $4.5\text{km/hr}$  towards the foot of the tower  $120\text{m}$  high. At what rate is he approaching the top of the tower when he is  $50\text{m}$  away from the tower?
- Q.7 The radius of a circular soap bubble is increasing at the rate of  $0.2\text{cm/sec}$ . Find the rate of increase of its volume when the radius is  $5\text{cm}$ .
- Q.8 The surface of a spherical balloon is increasing at the rate of  $2\text{cm}^2/\text{sec}$ . Find the rate of change of its volume when its volume when its radius is  $6\text{cm}$ .
- Q.9 Find the point on the curve  $y^2 = 8x$  for which the abscissa and ordinate change at the same rate.
- Q.10 At what point of the ellipse  $16x^2 + 9y^2 = 400$ , does the ordinate decrease at the same rate at which abscissa increases?