Comprehensive Test Series-06
(Application of Derivatives)
XII

TIME: 1hr. **MM: 30**

General Instructions:

- All Questions are compulsory.
- Use of calculator is not permitted.

Q.1 A stone is dropped into a quite lake and waves move in circles at the speed of 5cm/s. At the instant when the radius of the circular wave is 8cm, how fast is enclosed area increasing?

Q.2 The radius of a circle is increasing at the rate of 0.7cm/s. What is the rate of increase of its circumference?

Q.3 A ladder 5m long is learning against a wall. The bottom of the ladder is pulled along the ground, away from the wall, at the rate of 2cm/s. How fast is its height on the wall decreasing when the foot of the ladder is 4m away from the wall?

Q.4 A particle moves along the curve $6y = x^3 + 2$. Find the point on the curve at which the y-coordinate is changing 8 times as fast as the x-coordinate.

Q.5 A balloon, which always remains spherical, has a variable diameter $\frac{3}{2}(2x+1)$. Find the rate of change of its volume with respect to x.

Q.6 Sand is pouring from a pipe at the rate of $12cm^3/s$. The falling sand forms a cone on the ground in such a way that the height of the cone is always one-sixth of the radius of the base. How fast is the height of the sand cone increasing when the height is 4cm?

Q.7 The total revenue in Rupees received from the sale of x units of a product is given by $R(x) = 13x^2 + 26x + 15$. Find the marginal revenue cost when x = 7.

Q.8 The volume of a cube is increasing at a rate of 9 cubic centimeters per second. How fast is the surface area increasing when the length of an edge is 10 centimeters?

Q.9 The length x of a rectangle is decreasing at the rate of 3cm/minute and the width y is increasing at the rate of 2cm/minute. When x = 10cm and y = 6cm, find the rates of changes of (a) the perimeter and (b) the area of the rectangle.

Q.10 The total cost C(x) in Rupees, associated with the production of x units of an item is given by $C(x) = 0.005x^3 - 0.02x^2 + 30x + 5000$

Find the marginal cost when 3 units are produced, where by marginal cost we mean the instantaneous rate of total cost at any level of output.