

**Comprehensive Test Series-05**  
**(Application of Derivatives)**

**XII**

**TIME: 1.5hr.**

**MM: 60**

**General Instructions:**

- All Questions are compulsory.
  - Use of calculator is not permitted.
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Using differentials, find the approximate value of the each of the following up to 3 places of decimals.

- Q.1  $\sqrt{0.037}$ ,  $(26)^{\frac{1}{3}}$ ,  $(82)^{\frac{1}{4}}$ ,  $(0.0037)^{\frac{1}{2}}$ ,  $(3.968)^{\frac{3}{2}}$
- Q.2 Find the approximate value of  $f(5.001)$ , where  $f(x) = x^3 - 7x^2 + 15$ .
- Q.3 Find the approximate change in the volume  $V$  of a cube of side  $x$  metres caused by increasing the side by 1 %.
- Q.4 If the radius of a sphere is measured as 9 m with an error of 0.03 m, then find the approximate error in calculating its surface area.
- Q.5 Find point on the curve  $\frac{x^2}{4} + \frac{y^2}{25} = 1$  at which the tangents are (i) parallel to x-axis (ii) parallel to y-axis.
- Q.6 Find the point on the curve  $y = (x - 2)^2$  at which the tangent is parallel to the chord joining the points (2, 0) and (4, 4).
- Q.7 For the curve  $y = 4x^3 - 2x^5$ , Find all the points at which the tangent passes through the origin.
- Q.8 Find the point on the curve  $x^2 + y^2 - 2x - 3 = 0$  at which the tangents are parallel to the x-axis.
- Q.9 Find the equation of the normal at the point  $(am^2, am^3)$  for the curve  $ay^2 = x^3$ .
- Q.10 Prove that the curves  $x = y^2$  and  $xy = k$  cut at right angles if  $8k^2 = 1$ .
- Q.11 Find the equations of the tangent and normal to the hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$  at the point  $(x_0, y_0)$ .
- Q.12 A ladder 5m long is leaning 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.13 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.14 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.15 Sand is pouring from a pipe at the rate of  $12\text{cm}^3/\text{s}$ . 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.16 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  $x = 7$ .