

**Model Question Paper**  
**Application of differentiation- I - Part V**

12th Standard

**Business Maths**

Reg.No. : 

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I. Answer all the questions.

II. Use Blue pen only.

Time : 01:30:00 Hrs

Total Marks : 120

4 x 1 = 4

**Section-A**

- 1) The tangent to the curve  $y = 2x^2 - x + 1$  at (1, 2) is parallel to the line  
(a)  $y = 3x$  (b)  $y = 2x + 4$  (c)  $2x + y + 7 = 0$  (d)  $y = 5x - 7$
- 2) The slope of the tangent to the curve  $y = x^2 - \log x$  at  $x = 2$  is  
(a)  $\frac{7}{2}$  (b)  $\frac{2}{7}$  (c)  $-\frac{7}{2}$  (d)  $-\frac{2}{7}$
- 3) The slope of the curve  $x = y^2 - 6y$  at the point where it crosses the y axis is  
(a) 5 (b) -5 (c)  $\frac{1}{6}$  (d)  $-\frac{1}{16}$
- 4) For the cost function  $c = \frac{1}{10}e^{2x}$ , the marginal cost is  
(a)  $\frac{1}{10}$  (b)  $\frac{1}{5}e^{2x}$  (c)  $\frac{1}{10}e^{2x}$  (d)  $\frac{1}{10}e^x$

**Section-B**

7 x 6 = 42

- 5) A demand function is given by  $x^n = k$ , where n and k are constants. Calculate price elasticity of demand.
- 6) Show that the elasticity of demand at all points on the curve  $xy^2 = c$  (c is constant), where y represents price will be numerically equal to 2.
- 7) The demand curve for a monopolist is given by  $x = 100 - 4p$   
(i) Find the total revenue, average revenue and marginal revenue.  
(ii) At what value of x, the marginal revenue is equal to zero
- 8) The demand for a given commodity is  $q = -60p + 480$ , ( $0 < p < 7$ ) where p is the price. Find the elasticity of demand and marginal revenue when  $p = 6$ .
- 9) Find the slope of the curve  $y = \frac{x^2 - 12}{x - 4}$ , ( $x \neq 4$ ) at the point (0, 3) and determine the points where the tangent is parallel to the axis of x.
- 10) For the cost function  $y = 2x \left( \frac{x+4}{x+3} \right) + 3$ , prove that the marginal cost falls continuously as the output x increases.
- 11) Find the equilibrium price and equilibrium quantity for the following demand and supply functions  $Q_d = 4 - 0.06p$  and  $Q_s = 0.6 + 0.11p$

7 x 10 = 70

**Section-C**

- 12) If  $y = \frac{300}{x}$ , find the average rate of change of y with respect to x when x increases from 10 to 10.5. Find also the instantaneous rate of change of y at  $x = 10$ .
- 13) If the perimeter of a circle increases at a constant rate, prove that the rate of increase of the area varies as the radius of the circle.
- 14) Determine the values of l and m so that the curve,  $y = lx^2 + 3x + m$  may pass through the point (0, 1) and have its tangent parallel to the x-axis at  $x = 0.75$ .
- 15) Prove that for the cost function  $C = 100 + x + 2x^2$ , where x is the output, the slope of AC curve  $= \frac{1}{x}(MC - AC)$ .  
(MC is the marginal cost and AC is the average cost)
- 16) Find the equations of the tangent and normal at the point  $(a \cos \theta, b \sin \theta)$  on the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
- 17) Find the equation of the tangent and normal to the demand curve  $y = 10 - 3x^2$  at (1, 7).
- 18) Find the points on the curve  $y = (x-1)(x-2)$  at which the tangent makes an angle 135° with the positive direction of the x-axis.

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