

Choose the correct answer from the given options for each question given below and each carries 2 marks.

1. The equation of the tangent to the curve  $y(x+1) = 4$  at the point  $(2, \frac{4}{3})$  is  
 A.  $27x - 12y - 38 = 0$                       B.  $4x - 9y - 20 = 0$   
 C.  $4x + 9y - 20 = 0$                       D.  $9x - 4y + 20 = 0$
2. The slope of the normal to the curve  $x = a(\theta - \sin\theta), y = a(1 - \cos\theta)$  at  $\theta = \frac{\pi}{2}$  is  
 A. 0                      B.  $\frac{1}{\sqrt{2}}$                       C. 1                      D. -1
3. If  $\theta$  is the angle between the curves  $xy = 2$  and  $x^2 + 4y = 0$  then  $\tan\theta =$   
 A. -1                      B. 1                      C. 2                      D. 3
4. The length of the sub tangent of the curve  $x^2 + xy + y^2 = 7$  at  $(1, -3)$  is  
 A. 15                      B. 5                      C.  $\frac{3}{5}$                       D.  $\frac{1}{5}$
5. The value of  $c$  which satisfies the conclusions of Rolle's Theorem for the function  $f(x) = 2x^3 + x^2 - 4x - 2, x \in [-\sqrt{2}, \sqrt{2}]$  is  
 A. 0                      B. 1                      C.  $\frac{1}{2}$                       D.  $\frac{2}{3}$
6. The value of  $c$  which satisfies the conclusions of Lagrange's Mean Value Theorem for the function  $f(x) = 2\sin x + \sin 2x, x \in [0, \pi]$  is  
 A.  $\frac{\pi}{6}$                       B.  $\frac{\pi}{4}$                       C.  $\frac{\pi}{3}$                       D.  $\frac{\pi}{2}$
7. If  $f(x) = a\sin x + \frac{1}{3}\sin 3x$  has an extremum at  $x = \frac{\pi}{3}$  then  $a =$   
 A. 2                      B. 1                      C. 0                      D. -1

8. ✓ The function  $f(x) = \frac{x}{1+x^2}$  decreases in

- A.  $(-1,1)$                       B.  $(-\infty, -1) \cup (1, \infty)$                       C.  $\mathbb{R}$                       D.  $\emptyset$

9. ✓ The maximum value of the function

$$f(x) = 2x^3 - 21x^2 + 36x + 20, x \in [0,2]$$

- A. 30                      B. 32                      C. 37                      D. 44

10. ✓ The sum of two numbers is 8 so that the sum of their cubes is minimum then the numbers are

- A. 4,4                      B. 2,6                      C. 3,5                      D. 1,7

## Section B ( $2 \times 5 = 10$ M)

**Answer any TWO of the following questions**

11. Find the equation of the locus of  $P$ , if the ratio of the distance from  $P$  to  $A(5, -4)$  and  $B(7,6)$  is 2:3.

12. Find the equation of the locus of a point  $P$ , then sum of whose distance from  $(0,2)$  and  $(0,-2)$  is 6.

13. Show that the equation of the tangent at  $P(x_1, y_1)$  to the curve

$$\sqrt{x} + \sqrt{y} = \sqrt{a} \text{ is } \frac{y}{\sqrt{y_1}} + \frac{x}{\sqrt{x_1}} = \sqrt{a}.$$

14. A wire of length  $l$  is cut into two parts which are bent in the form of a square and a circle respectively. What are the lengths of the pieces of the wire so the sum of the areas is the least.