



XI-SCI : Maths  
Differentiation,

DATE:

TIME: 1 Hours 30  
Minutes

MARKS: 25

SEAT NO:

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**Note:-**

1. All Questions are compulsory.
2. Numbers on the right indicate full marks.

**Section A**

**Q.1. Select and write the correct answer.**

**(4)**

1.  $f(x) = 2x + 6$  for  $0 \leq x \leq 2$   
 $= ax^2 + bx$  for  $2 < x \leq 4$   
is differentiable at  $x = 2$  then the values of  $a$  and  $b$  are

A)  $a = -\frac{3}{2}, b = 3$     B)  $a = -\frac{3}{2}, b = 8$   
C)  $a = \frac{1}{2}, b = 8$     D)  $a = -\frac{3}{2}, b = 8$

2. Differentiate  $y = \frac{\sin x}{1 - \cos x}$  w.r.t.  $x$

A)  $\frac{-1}{1 - \cos x}$     B)  $\frac{+1}{1 + \cos x}$   
C)  $1 - \cos x$     D)  $\frac{-1}{1 + \sin x}$

**Q.2. Answer the following.**

**(3)**

1. Differentiate the following w.r.t.  $x$ .  
 $y = e^x \log x$
2. Find the derivative of the following w.r.t.  $x$  by using method of first principle.  
 $3^x$
3. Differentiate the following w.r.t.  $x$ .  
 $y = x^5 \tan x$

**Section B**  
**Attempt any Four**

**Q.3 Test whether the function**

**(2)**

$f(x) = x^2 + 1$ , for  $x \geq 2$   
 $= 2x + 1$ , for  $x < 2$  is differentiable at  $x = 2$ .

**Q.4 Find the derivative of the following w.r.t.  $x$ . at the point indicated against them by using method of first principle. (2)**

$2^{3x+1}$  at  $x = 2$

- Q.5 Differentiate the following w.r.t. x. (2)  
 $y = x^5 \tan x$

$$y = x^5 \tan x$$

Differentiate w. r. t. x

$$\begin{aligned}\frac{dy}{dx} &= \frac{d}{dx} (x^5 \tan x) \\ &= x^5 \frac{d}{dx} (\tan x) + (\tan x) \frac{d}{dx} (x^5) \\ &= x^5 (\sec^2 x) + (\tan x)(5x^4)\end{aligned}$$

$$\frac{dy}{dx} = x^4(x \sec^2 x + 5 \tan x)$$

- Q.6 Differentiate the following w.r.t. x. (2)  
 $y = x^3 \log x$

- Q.7 Differentiate the following functions w.r.t. x : (2)  
 $y = \sqrt{x} + \tan x - x^3$

- Q.8 Differentiate the following w.r.t. x. (2)  
 $y = e^x \log x$

**Section C**  
**Attempt any Two**

- Q.9 Differentiate the following functions w.r.t. x : (3)  
 $y = 3 \cot x - 5e^x + 3 \log x - \frac{4}{x^{3/4}}$

- Q.10 Differentiate the following w.r.t. x. (3)  
 $y = x^2 \sqrt{x} + x^4 \log x$

- Q.11 Determine the values of p and q that make the function f(x) differentiable on R where (3)  
$$\begin{aligned}f(x) &= px^3, \text{ for } x < 2 \\ &= x^2 + q, \text{ for } x \geq 2\end{aligned}$$

**Section D**  
**Attempt any One**

- Q.12 If  $f(x) = \sin x - \cos x$  if  $x \leq \frac{\pi}{2} = 2x - \pi + 1$ , if  $x > \frac{\pi}{2}$  Test the continuity and differentiability of f at x (4)  
 $= \frac{\pi}{2}$

Q.13 Find the derivatives of the following w.r.t.x by using method of first principle  $\sec(5x - 2)$

**(4)**