

FACULTY HIGHER SECONDARY SCHOOL

SUB- MATHS

SAMPLE PAPER 2

CLASS – 12

Time – 3hours

GENERAL INSTRUCTION

1. ALL THE QUESTION ARE COMPULSARY
2. SECTION A consist of 20 question and each question carries 1 marks
3. SECTION B consist of 6 question and each question carries 2 marks
4. SECTION C consist of 6 question and each question carries 4 marks
5. SECTION D consist of 4 question and each question carries 6 marks
6. There total 36 question. No overall choices are given , however few internal choices are provided in SECTION C and SECTION D

Choose the correct answer

1. if  $x^y = e^{x-y}$ , then  $\frac{dy}{dx}$  is

- a)  $\frac{1+x}{1+\log x}$       b)  $\frac{1-\log x}{1+\log x}$       c)  $\frac{\log x}{(1+\log x)^2}$       d) *not defined*

2. The derivative of  $\cos^{-1}(2x^2 - 1)$  with respect to  $\cos^{-1} x$

- a) 2      b)  $\frac{1}{2\sqrt{1-x^2}}$       c)  $\frac{2}{x}$       d)  $1-x^2$

3. The function  $f(x) = x - [x]$ , where  $[.]$  denotes the greatest integer function

- a) Continuous everywhere  
 b) Continuous at integer point only.  
 c) Continuous at non integer points only  
 d) Differentiable everwhwere

4. The function  $f: [0, \infty) \rightarrow R$  given by  $f(x) = \frac{x}{x+1}$  is

- a) One-one and onto  
 b) One –one but not onto  
 c) Onto but not one-one

d) Neither one – one nor onto

5. If  $f: R \rightarrow R$  is given by  $f(x) = 3x - 5$  then  $f^{-1}(x)$

a) Is given by  $\frac{1}{3x-5}$

b) c) given by  $\frac{x+5}{3}$

c) Does not exist because  $f$  is not one-one.

d) Does not exist because  $f$  is not onto.

6. The maximum number of equivalence relation on the set

$A=\{1, 2, 3\}$  is

a) 1

b) 2

c) 3

d) 5

7. The values of  $a, b, c$  And  $d$  if

$$\begin{bmatrix} 2a + b & a - 2b \\ 5c - d & 4c + 3d \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 11 & 24 \end{bmatrix} \text{ is}$$

a)  $a = 1, b = 2, c = 3, d = 4$

b)  $a = 0, b = 2, c = 3, d = 5$

c)  $a = 3, b = 5, c = 6, d = 1$

d)  $a = -1, b = -3, c = 5, d = 3$

8.  $\begin{bmatrix} \sqrt{3} & 0 & 0 \\ 0 & \sqrt{3} & 0 \\ 0 & 0 & \sqrt{3} \end{bmatrix}$  is called

a) Diagonal matrix

b) Scalar matrix

c) Identity matrix

d) Both (a) and (b)

9. Which of the following is false

a)  $(A^T)^T = A$

c)  $A^T + B^T = (A+B)^T$

b)  $(KA)^T = K A^T$

d)  $(AB)^T = A^T B^T$

10.  $\tan^{-1} a - \tan^{-1} b = \frac{\pi}{4}$ ,  $ab < 1$ , then the value of  $a+b+ab$   
 a) 0                      b) 1,      c) -1                      d) 2
11.  $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)$  is equal to  
 a)  $\frac{1}{2}$                       b)  $\frac{1}{3}$       c)  $\frac{1}{4}$       d) 1
12.  $\int_1^e \log x dx =$  \_\_\_\_\_  
 a)  $\frac{1}{2}$                       b)  $\frac{1}{3}$                       c)  $\frac{1}{4}$                       d) 1
13. The value of  $\int \frac{\cos\sqrt{x}}{\sqrt{x}} dx$  is  
 a)  $2\cos\sqrt{x} + c$       b)  $\sqrt{\frac{\cos x}{x}} + c$                       c)  $\sin\sqrt{x} + c$       d)  $2\sin\sqrt{x} + c$
14.  $\int \operatorname{cosec} x dx =$  \_\_\_\_\_  
 a)  $\log \cos x + c$                       b)  $\log \sin x + c$   
 c)  $\log |\operatorname{cosec} x - \cot x| + c$                       d) None of these
15. The area bounded by the curve  $y = \sin x$  between  $x=0$  and  $x=2\pi$ .  
 a) 2                      b) 3                      c) 3                      d) 4
16. Find  $x$  if  $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$
17. Let  $A$  be a square matrix of order  $3 \times 3$ . write the value of  $|2A|$ , where  $|A| = 4$ .
18. Find the value of  $\int \frac{\log x dx}{x}$
19. Give an example of a reflexive and transitive but not transitive relation.
20. The curve  $y = x^{1/5}$  has at  $(0, 0)$   
 a) a vertical tangent ( parallel to  $y$ - axis )

- c) a horizontal tangent ( parallel to x- axis)
- d) an oblique tangent
- e) no tangent

### **Section B**

21. Check the injectivity of the function  $f: R \rightarrow R$  , defined by  $f(x) = 2-3x$
22. Show that  $AA'$  and  $A'A$  are both symmetric matrices for any matrix A.
23. Find  $\int \frac{\sqrt{\tan x} dx}{\sin x \cos x}$
24. If A is invertible matrix of 3x3 and  $|A| = 7$  , then find  $|A^{-1}|$
25. Show that the function f given by  $f(x)=\tan^{-1}(\sin x + \cos x)$  is decreasing for all  $x \in (\frac{\pi}{4}, \frac{\pi}{2})$
26. Differentiate  $\sqrt{e^{\sqrt{x}}}$  w. r .t x,  $x>0$

### **Section C**

27.  $\cot^{-1} 7 + \cot^{-1} 8 + \cot^{-1} 18 = \cot^{-1} 3$
28. Find the matrix A satisfying the matrix equation 
$$\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$
29. Show that the function  $f(x) = |x-3|$ ,  $x \in R$ , is continuous but not differential at  $x=3$ .
30. Find the value of a and b , if the function given by  $f(x) = \begin{cases} ax^2 + b, & \text{if } x < 1 \\ 2x + 1, & \text{if } x \leq 1 \end{cases}$  is differential at  $x=1$
31. If  $y = Ae^{mx} + Be^{nx}$ , then show that 
$$\frac{d^2y}{dx^2} - (m + n) \frac{dy}{dx} + mny = 0$$
32. Evaluate  $\int_0^{\pi} \frac{x \tan x dx}{\sec x + \tan x}$

### Section D

33. Using integration, find the area bounded by the tangent to the curve  $4y = x^2$  at the point  $(2, 1)$  and the lines whose equations are  $x = 2y$ ,  $x = 3y - 3$

Or

Find the area of the region  $\{(x, y): x^2 \leq y \leq x\}$

34. Evaluate  $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1 + \sqrt{\cot x}}$

Or

Evaluate  $\int (\sqrt{\cot x} + \sqrt{\tan x}) dx$

35. Show that the right circular cone of least curved surface and given volume has an altitude equal to  $\sqrt{2}$  times the radius of the base.

Or

Prove that the least perimeter of an isosceles triangle in which a circle of radius  $r$  can be inscribed is  $6\sqrt{3r}$ .

36. If  $a \neq b \neq c$  and  $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = 0$ , then using properties of determinants, prove that  $a + b + c = 0$

Or

A shopkeeper has 3 varieties pens A, B, C. Meenu purchased 1 pen of each variety for a total of ₹ 21. Jeevan purchased 4 pens of A variety, 3 pens of B variety and 2 pens of C variety for ₹ 60. While Shikha purchased 6 pens of A variety, 2 pens of B variety and 3 pens of C variety for ₹ 70. Using matrix method, find the cost of each variety of pen.

