

SA 1  
PART - A 1 MARKS EACH  
PART - B 4 MARKS EACH  
PART - C 6 MARKS EACH

PART - A

1. Write in the simplest form:

$$\tan^{-1} \left( \frac{\cos x}{1 + \sin x} \right)$$

2. Compute :  $[1 \ 2] \begin{bmatrix} 3 \\ 4 \end{bmatrix} + [0 \ 3 \ -1 \ 2] \begin{bmatrix} 5 \\ -6 \\ 8 \\ 2 \end{bmatrix}$

3. For what value of  $k$ , the matrix  $\begin{bmatrix} 2 & 1 & -5 \\ 0 & 3 & k \\ 1 & 3 & 2 \end{bmatrix}$  is singular?

4. Find the value of,  $\cos^{-1} \left( \cos \frac{2\pi}{3} \right) + \sin^{-1} \left( \sin \frac{2\pi}{3} \right)$

5. If  $A' = \begin{bmatrix} -2 & 3 \\ 1 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$ , find  $(A+2B)'$ .

6. Find the value of  $x$ ,  $y$  and  $z$ , if  $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$

PART - B

7. Prove that  $\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3 = \pi$

8. If  $y = x^x \sin x^{-1} x^x$ , find  $\frac{dy}{dx}$

9. If  $y = \cos e c^{-1} x$ ,  $x > 1$ , then show that  $x(x^2 - 1) \frac{d^2 y}{dx^2} + (2x^2 - 1) \frac{dy}{dx} = 0$

10. A particle moves along the curve  $y = \frac{2}{3} x^3 + 1$ . Find the points on the curve at which the  $y$ -coordinate is changing twice as fast as the  $x$ -coordinate.

11. Evaluate  $\int \frac{\sin x}{\sin 3x} dx$

12. Evaluate  $\int_0^1 |3x - 2| dx$ .

$-6 - 6 + 2 = -9$

13. If  $\tan^{-1} \left( \frac{y}{x} \right) = \log \sqrt{x^2 + y^2}$ , prove that  $\frac{dy}{dx} = \frac{x+y}{x-y}$ .

cos 2

14. If  $y = e^x (\sin x + \cos x)$ , then show that  $\frac{d^2y}{dx^2} - 2 \frac{dy}{dx} + 2y = 0$ .

15.  $\int \sin x \sin 2x \sin 3x \, dx$ .

15 of 3b = 33  
 $\frac{1}{3} a + b = 55$

16.  $\int x \tan^{-1} x$

18b = 22

17.  $\int \frac{\cos 2x - \cos 2x}{\cos x - \cos x}$

22

18. Find the values of  $a$  and  $b$  such that the function  $f$  defined by

$$f(x) = \begin{cases} 3ax + b, & \text{if } x > 1 \\ 11, & \text{if } x = 1 \\ 5ax - b, & \text{if } x < 1 \end{cases}$$

is continuous at  $x = 1$ .

21 Me

19. Find the interval(s) in which the function  $f(x) = 2x^3 - 15x^2 + 36x + 1$  is strictly increasing or decreasing. Also find the points at which the tangents are parallel to the  $x$ -axis.

PART - C

20. using properties prove that

$$\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = (1+a^2+b^2)^3$$

21.  $\int_0^{+\infty} \log \sin x \, dx$

22. If  $\tan^{-1} a + \tan^{-1} b + \tan^{-1} c = \pi$ , prove that  $a + b + c = abc$

23. Show that  $y = \log(1+x) - \frac{2x}{2+x}$ ,  $x > -1$  is an increasing function of  $x$ , throughout its domain.

24. Using elementary transformations, find the inverse of the following matrix:

$$\begin{bmatrix} 2 & -1 & 4 \\ 4 & 0 & 2 \\ 3 & -2 & 7 \end{bmatrix}$$

25. A wire of length 36m is cut into two pieces, one of the pieces is turned in the form of a square and the other in the form of an equilateral triangle. Find the length of each piece so that the sum of the two be minimum.

26. (i) If  $x = a \left( \cos t + \log \tan \frac{t}{2} \right)$ ,  $y = a(1 + \sin t)$ , find  $\frac{d^2y}{dx^2}$

(ii) If  $x = \sqrt{a \sin^{-1} t}$ ,  $y = \sqrt{a \cos^{-1} t}$ , show that  $\frac{dy}{dx} = \frac{-y}{x}$