

APEEJAY SCHOOL PITAMPURA

**FIRST TERM EXAM**

XII (MATHS)

M.M. 100

TIME : 3 Hours

**NOTE:** All Question are compulsory.

- \* Section A contains 6Q of 1 mark each
- \* Section B contains 13 Q of 4 marks each.
- \* Section C contains 7Q of 6 marks each .

**Section- A**

1. If A is an invertible matrix of order 3x3 and  $|A|=4$ , then find  $|adj(adjA)|$ .
2. If  $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ , then find  $A^{19}$ .
3. If the equation of tangent at (2,3) on the curve  $y^2 = px^3 + q$  is  $y = 4x - 5$ , find the values of p and q.
4. Without using derivative, find that  $f(x) = 2x + 17$  is increasing or decreasing function.
5. Evaluate  $\int \sqrt{k^2 - x^2} dx$
6. Using Determinants, prove that  $a+b=ab$ , if the points (a,0), (0,b) and (1,1) are collinear.

**Section-B**

7. Form the Differential Equation of the parabola  $y^2 = 4ax$
8. Evaluate:  $\int_0^1 \cot^{-1}(1 - x + x^2) dx$
9.  $\int \frac{x^2 dx}{(x \sin x + \cos x)^2}$
10. Evaluate the following  $\int_0^{3/2} x \cos \pi x dx$
11.  $\int \frac{\tan \theta + \tan^3 \theta}{1 + \tan^3 \theta} d\theta$

12.  $\int \frac{\sqrt{x^2 + 1} [\log(x^2 + 1) - 2 \log x]}{x^4} dx$

13. Evaluate:  $\int_0^{\pi} \frac{x dx}{a^2 \cos^2 x + b^2 \sin^2 x}$

14. Find the value of x:  $\sin^{-1}(1-x) - 2\sin^{-1}(x) = \frac{\pi}{2}$

15. If  $A = \begin{bmatrix} 4 & 3 \\ 3 & 5 \end{bmatrix}$ , then find x and y such that  $A^2 - xA + yI = 0$ . Hence evaluate  $A^{-1}$ .

16. Differentiate  $\log(x^x + \cos ec^2 x)$  w.r.t x.

17. Differentiate  $\log_9 x + \log_x 9 + \log_x x + \log_9 9$  w.r.t.x

18. A woman 2 meters tall, walks at the rate of 6m/min away from a source of light that is 5m above the ground. How fast is the length of her shadow increasing when she is 3m away from the base of the light?

19. Using differential, find approximate value of  $\log_e(4.04)$ , if  $\log_{10} 4 = 0.6021$  and  $\log_{10} e = 0.4343$

### Section-C

20. Show that the differential equation  $2ye^{x/y} dx + (y - 2xe^{x/y}) dy = 0$  is homogeneous and find its particular solution, given that  $x=0$  and  $y=1$ .

21. Find the area enclosed between two circles  $(x-2)^2 + y^2 = 4$  and  $x^2 + y^2 = 4$  (Using integration)

22. By using limit of sum method Evaluate:  $\int_0^2 (2x^2 - x + 7 + e^{-x}) dx$

23. Using integration, find the area  $\{(x,y) : |x+2| \leq y \leq \sqrt{20-x^2}\}$ .

24. A given quantity of metal is to be cast into a half cylinder with a rectangular base and semicircular ends. Show that the total surface area is minimum when the ratios of the length of the cylinder to the diameter of its semicircular ends is  $\pi : (\pi + 2)$ .

25. The sum of three numbers is 6. If we multiply the third number by 3 and add second number to it, we get 11. By adding the first and the third numbers, we get double of the second number. Represent it algebraically and find the numbers using matrix method.

26.

(a) If  $a, b, c$  are the  $p^{\text{th}}, q^{\text{th}}$  and  $r^{\text{th}}$  term respectively of a G.P. prove that

$$\begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix} = 0$$

(4)

(b) Find inverse of the matrix  $\begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$  by using elementary Row Transformation.

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