

19. (a) Derive the equation of the bisectors of the angles between straight lines.

(b) Find the correlation coefficient from the following data :

x:	32	38	48	43	40	22	41	69	35	64
y:	30	31	38	43	33	11	27	75	40	69

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MAY 2008

MATHEMATICS

Time : Three hours Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. Evaluate $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$, when n is negative integer.
2. Find $\frac{dy}{dx}$ when $x^3 + 3axy + y^3 = a^3$.
3. Evaluate $\int \sin^{-1} x \, dx$.
4. Evaluate $\int \frac{x}{(1+x)(1+x^2)} \, dx$.
5. Prove that the scalar multiplication is distributive over vector addition.
6. Find the inverse of the Matrix $\begin{bmatrix} 1 & 2 & 5 \\ 3 & 1 & 4 \\ 1 & 1 & 2 \end{bmatrix}$.

7. Prove that any equation of the first degree in x and y always represents a straight line.

8. Prove that the equation $12x^2 + 7xy - 10y^2 + 13x + 45y - 35 = 0$ represents a pair of two straight lines.

9. Find the mean for the following data: 18, 15, 18, 16, 17, 18, 15, 19, 17, 17.

10. Obtain the standard deviation of the following data:

$X:$	4.5	6.5	8.5	10.5	12.5	14.5
$F:$	4	10	20	15	8	3

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. If $y = \sin^{-1} x$ prove $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - n^2y_n = 0$.

12. Evaluate $\int_0^{\frac{\pi}{2}} \log \sin x \, dx$.

13. Show that the four points whose position vectors are $3i + 2j + 4k$; $6i + 3j + 2k$; $5i + 7j + 3k$; $2i + 2j + 5k$ are coplanar.

14. Solve $x(x - y)dy + y^2 dx = 0$.

15. Find the values of h and f so that the equation $9x^2 + 2hxy + 4y^2 + 6x + 2fy - 3 = 0$ represent a pair of parallel lines and find the distance between them.

16. The following data related to the marks of 10 students in the internal test and the University examination for the maximum of 50 in each.

Internal Marks:	25	28	30	32	35	36	38	39	42	45
University Marks:	20	26	29	30	25	18	26	35	35	46

Obtain the two regression equations.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. (a) If $y = (\sin^{-1} x)^2$ prove $(1 - x^2)Y_{n+1} - (2n - 1)xy_n - (n - 1)^2 y_{n-1} = 0$.

(b) Find the angle of intersection between the curves $x^2 - y^2 = a^2$ and the curve $x^2 + y^2 = a^2\sqrt{2}$.

18. (a) Evaluate $\int_0^{\pi} \frac{x}{a^2 \cos^2 x + b^2 \sin^2 x} dx$.

(b) Using vectors, prove that the diagonals of a parallelogram bisect each other.