

19 (a) Find the mean and standard deviation of the following data :

$x :$	2.0	2.5	3.0	3.5	4.0	4.5	5.0
$f :$	5	38	65	92	70	40	10

(b) Five coins are tossed 3200 times. Find the expected frequencies of distribution of heads and tails. Calculate the mean number of heads and standard deviation.

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MATHEMATICS

Time : Three hours

Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

- Find $\frac{dy}{dx}$ if $x = a \cos^3 t$, $y = a \sin^3 t$.
- Find the n th derivative of $\cos x \cos 2x \cos 3x$.
- Evaluate $\int \frac{3x+1}{2x^2+x+1} dx$.
- Evaluate $\int \frac{\sin x}{\sin x + \cos x} dx$.
- Show that the diagonals of a rhombus are at right angles.
- Find the value of
 - $2A + B$
 - $B - 3C$ where

$$A = \begin{pmatrix} 1 & 0 \\ -1 & 2 \end{pmatrix} \quad B = \begin{pmatrix} 3 & 1 \\ 0 & -1 \end{pmatrix}$$

BCA ✓
I year
II no
III not year

7. State the condition for a straight line $y = mx + c$ touches the circle $x^2 + y^2 = a^2$.

8. Solve $(x^2 - y^2) dx = 2xy dy$.

9. Calculate the median for the following data :

CI: 1-10 11-20 21-30 31-40 41-50 51-60 61-70

f : 8 15 25 20 16 10 6

10. A card is drawn from each of two well shuffled packs of cards. Find the probability that at least one of them is an ace.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. If $y = a \cos(\log x) + b \sin(\log x)$ show that $x^2 y_{n+2} + (2n + 1)xy_{n+1} + (n^2 + 1)y_n = 0$.

12. Evaluate find $I = \int \frac{(2 + 3 \cos x)}{(\sin x + 2 \cos x + 3)} dx$.

13. Solve the following system of equations by matrix method.

$$x + 2y + 3z = 1$$

$$2x + 3y + 2z = 2$$

$$3x + 3y + 4z = 1.$$

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14. Find the equation of the circle which touches the straight line $3x + y - 4 = 0$ at the point $\left(\frac{1}{2}, \frac{5}{2}\right)$ and has its centre on the line $x + y - 5 = 0$.

15. Solve $(mz - ny)p + (nx - lz)q = ly - mx$.

16. Fit a straight line for the following data :

X : 100 200 300 400 500 600

Y : 40.2 92.3 94.2 96.3 98.2 100.3

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. (a) If $y = \sin(m \sin^{-1} x)$, prove that $(1 - x^2)y_2 - xy_1 + m^2y = 0$.

(b) Show that $\int \log(\tan x + \cot x) dx = \pi \log 2$.

18. (a) Find the inverse of the matrix

$$A = \begin{pmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{pmatrix}.$$

(b) Solve $x^2(y - z)p + y^2(z - x) = z^2(x - y)$.

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