

12251
MATHEMATICS
Abbottabad 2025
PART-II

P-396

Time: 2 Hours 40 Minutes

SECTION-B

Marks: 50

1. Attempt any ten of the following short questions. Each question carries 5 marks.

i. Sketch the graph of $x^2 + y^2 = 4$

ii. If $y = \ln\left(\sqrt{\frac{x^2+1}{x^2-1}}\right)$ then find $\frac{dy}{dx}$

iii. Find the equation of normal line to the curve $x^2 + 2xy = y^3$ at $(1, -1)$

iv. Find all the critical values of $f(x) = 6x^{14} - 4x$

v. Differentiate the function $f(x) = |\sin i + \cos j - 2xk|$

vi. Evaluate $\int (x^2 - 2)e^{x^3 - 6x + 4} dx$

vii. Find $\frac{dy}{dx}$ if $y = (x^2 - 2x)(x^3 - 3)^2$

viii. Evaluate $\int_0^{\pi} \sec^2 \theta d\theta$

ix. Find the perpendicular distance from a line $7x + 3y = 9$ to a point $(2, 3)$

x. Find the points of intersection of the line $3x - 4y + 20 = 0$ and the circle $x^2 + y^2 = 16$

xi. For what value of c , the line $2x - y + c = 0$ touches $\frac{x^2}{36} + \frac{y^2}{4} = 1$

xii. Find the equation of tangent and normal line at a point $(-4, 2)$ to parabola $x^2 = 8y$

xiii. Find the general solution of $\frac{dy}{dx} = \frac{x+y}{x}$

SECTION-C

Marks: 30

NOTE: Attempt any three of the following questions. Each question carries 10 marks.

2. i. Check the converges of the sequence $\frac{n^3 + n^3 + 2}{7n^4 + n^2 + 5}$

ii. Differentiate the function $f(x) = \frac{1 + \sin x}{2 - \cos x}$

3. i. Find the n th derivatives of $f(x) = \cos(ax + b)$

ii. Evaluate $\int \frac{x + 3x^2}{\sqrt{x}} dx$

4. i. Find the area of triangular region ABC whose vertices are $A(-2, 4)$, $B(1, -2)$, $C(3, -6)$

ii. Find the centre and radius in $x^2 + y^2 - x - 8y + 18 = 0$

5. i. Find the vertex, focus, directrix of parabola $x^2 = 8y$

ii. Find f_x and f_y at $\left(\frac{\pi}{3}, 0\right)$ in $f(x, y) = x^2 \sin(3y + x^2)$