

MATHEMATICS, Paper – IB**(English Version)****MODEL QUESTION PAPER****(For the Academic year 2021 – 2022 only)****Time : 3 Hours****Max. Marks : 75****NOTE:** This question paper consists of three sections A, B and C

SECTION – A**Very short answer type questions.****(i) Answer ANY TEN questions.****(ii) Each question carries 2 marks.****10 × 2 = 20**

1. Find the equation of the line passing through $(at_1^2, 2at_1)$ and $(at_2^2, 2at_2)$
2. Transform the equation $x + y - 2 = 0$ into normal form.
3. Find the angle which the straight line $y = \sqrt{3}x - 4$ makes with the Y – axis.
4. Find the length of the perpendicular from $(0, 0)$ to the straight line $x - 3y - 4 = 0$.
5. Show that the points $(1, 2, 3)$, $(7, 0, 1)$ and $(-2, 3, 4)$ are collinear.
6. Find the ratio in which the Y Z– plane divides the line joining $A(2, 4, 5)$ and $(3, 5, -4)$.
7. Find the coordinates of the vertex 'C' of ΔABC if it's centroid is the origin and the vertices A, B are $(1,1,1)$ and $(-2, 4, 1)$ respectively.
8. Find the equation of the plane whose intercepts on X, Y, Z - axes are 2, 3, 4 respectively.
9. Show that $\lim_{x \rightarrow 0^+} \left\{ \frac{2|x|}{x} + x + 1 \right\} = 3$
10. Find $\lim_{x \rightarrow 0} \frac{e^{x+3} - e^3}{x}$.

11. Compute : $\lim_{x \rightarrow 0} \frac{a^x - 1}{b^x - 1}$ ($a > 0, b > 0, b \neq 1$)
12. Find the derivative of $5 \sin x + e^x \log x$.
13. Find the derivative of the function $f(x) = \log_7 \log x (x > 0)$.
14. Find the approximate value of $\sqrt[3]{65}$.
15. Find the slope of the tangent to the curve $y = 3x^4 - 4x$ at $x = 4$.

SECTION - B

Short answer type questions .

5 × 4 = 20

(iii) Answer ANY FIVE questions.

(iv) Each question carries 4 marks.

16. A(2, 3) and B(-3, 4) are two given points. Find the equation of the locus of P, so that the area of the triangle PAB is 8.5 sq. units.
17. Find the equation of the locus of P, if A = (-5, 0), B = (5, 0) and $|PA - PB| = 8$
18. A(1, 2), B(2, -3) and C(-2, 3) are three points, A point P moves Q. $PA^2 + PB^2 = 2PC^2$, show that the equation of the locus of P is $7x - 7y + 4 = 0$.
19. When the origin is shifted to point A(2, 3), the transformed equation of the curve is $x^2 + 3xy - 2y^2 + 17x - 7y - 11 = 0$. Find the original equation of the curve.
20. When the axes are rotated through an angle 45° . Find the transformed equation of curve is $17x^2 - 16xy + 17y^2 = 225$. Find the original equation of curve.
21. A straight line parallel to the line $y = \sqrt{3}x$ passes through Q(2, 3) and cuts the line $2x + 4y - 27 = 0$ at P. Find length PQ.
22. Find the value of p, if the following lines are concurrent. $3x + 4y = 5, 2x + 3y = 4, px + 4y = 6$.

23. Show that the points $O(0, 0, 0)$, $A(2, -3, 3)$, $B(-2, 3, -3)$ are collinear. Find the ratio in which each point divides the segment joining the other two.
24. Compute the limit $\lim_{x \rightarrow 0} \frac{1 - \cos mx}{1 - \cos nx}$, $n \neq 0$.
25. Find the derivative of $\sec 3x$ from the first principle.
26. If the increase in the side of a square is 4%. Then find the approximate percentage of increase in the area of the square.
27. Show that the tangent at any point θ on the curve $x = c \sec \theta$, $y = c \tan \theta$ is $y = \sin \theta = x - c \cos \theta$.

SECTION – C

Long Answer type questions .

$5 \times 7 = 35$

(v) Answer ANY FIVE questions.

(vi) Each question carries 7 marks.

28. Find the equation of straight lines passing through $(1, 2)$ and making an angle of 60° with the line $\sqrt{3}x + y + 2 = 0$.
29. Find the circumcentre of the triangle whose vertices are $(1, 3)$, $(0, -2)$ and $(-3, 1)$.
30. Find the orthocenter of the triangle with the vertices $(-2, -1)$, $(6, -1)$, $(2, 5)$.
31. If the angle between the pair of straight lines $ax^2 + 2hxy + by^2 = 0$ is θ , then show that
$$\cos \theta = \frac{|a+b|}{\sqrt{(a-b)^2 + 4h^2}} .$$
32. Find the value of k , if the joining the origin to points of intersection of the curve $2x^2 - 2xy + 3y^2 + 2x - y - 1 = 0$ and the line $x + 2y = k$ are mutually perpendicular.
33. Find the angle between the lines whose direction cosines satisfy the equations $l + m + n = 0$, $l^2 + m^2 + n^2 = 0$.

34. Find the derivative of $\frac{\sin(x+a)}{\cos x}$.

35. If $y = \frac{x \sin^{-1} x}{\sqrt{1-x^2}}$ find $\frac{dy}{dx}$.

36. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ then show that $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$.

37. Show that the curves $y^2 = 4(x+1)$ and $y^2 = 36(9-x)$ intersect orthogonally.