MATHEMATICS, Paper – I (B)
(English Version)

Time : 3 Hours   **Max. Marks : 75**

Note : This question paper consists of three sections A, B and C.

SECTION – A

Note : i) Answer **all** questions   **10 × 2 = 20**

   ii) Each question carries **two** marks

   iii) All are very **short answer** type questions

1. If the portion of the straight line intercepted between the axes is bisected at (2p,2q), write the equation of the straight line.

2. Find the point of intersection of the straight lines $\frac{x}{a}+\frac{y}{b}=1, \frac{x}{b}+\frac{y}{a}=1 \, (a \neq \pm b)$

3. Find the constant k so that the planes $x-2y+kz=0$ and $2x+5y-z=0$ are at right angles. Find the equation of the plane through (1,-1,-1) and perpendicular to these planes.

4. Verify whether the points A(2,-4,3), B(-4,5,6), C(4,-7,2) are collinear or not by using section formula.

5. Evaluate $\underset{x \to 0}{Lt} \left(\sqrt{x}+x^{5/2}\right)(x>0)$

6. Show that $\underset{x \to 0}{Lt} \frac{1-\cos x}{x} = 0$

7. Find the derivative of the $\frac{a-x}{a+x}$ w. r. t. x

8. If $ay^4=(x+b)^5$ then show that $5yy_2 = y_1^2$

9. Find the approximate value of $\sqrt{82}$

10. Verify Lagrange's mean value theorem for the function $f(x)=x^2$ in [2,4]

SECTION – B

II. Note : i) Answer any **five** of the following questions.   **5 × 4 = 20**

   ii) Each question carries **four** marks.

   iii) All are **short answer** type questions.

11. A(5,3), B(3,-2) are two points. If a point P forms a triangle of area 9 square unit with A,B then find the locus of P.

12. Line L has intercepts a and b on the axes of coordinates. When the axes are rotated through a given angle, keeping the origin fixed, the same line L has intercepts p and q on the transformed axes. Prove that $\dfrac{1}{a^2}+\dfrac{1}{b^2}=\dfrac{1}{p^2}+\dfrac{1}{q^2}$.

13. Check the continuity of f given by $f(x)=\begin{cases} 4-x^2 & if \quad x\le 0 \\ x-5 & if \quad 0<x\le 1 \\ 4x^2-9 & if \quad 1<x<2 \\ 3x+4 & if \quad x\ge 2 \end{cases}$ at the point 0,1 and 2.

14. If $x=\tan e^{-y}$ then show that $\dfrac{dy}{dx}=\dfrac{-e^{y}}{1+x^2}$

15. Suppose we have a rectangular aquarium with dimensions of length 8m, width 4m and height 3m. Suppose we are filling the tank with water at the rate of 0.4 cubic metre/sec. How fast is the height of water changing when the water level is 2.5 m?

16. Find the lengths of normal and subnormal to the curve $y=\dfrac{a}{2}\left(e^{x/a}+e^{-x/a}\right)$ at any point.

17. A container in the shape of an inverted cone has height 12 cm and radius 6 cm at the top. If it is filled with water at the rate of 12 cubic cm/sec., what is the rate of change in the height of water level when the tank is filled 8 cm?

SECTION – C

III. Note : i) Answer any **five** of the following questions.　　　　　**5 ×7 = 35**

　　　　ii) Each question carries **seven** marks.

　　　　iii) All are **long answer** type questions.

18. Find the circum centre of the triangle formed by the lines.
$3x-y-5=0, x+2y-4=0, 5x+3y+1=0$

19. Find the product of the lengths of perpendicular drawn from (2,1) upon the lines
$12x^2+35xy+12y^2+10x+11y+2=0$

20. Find the condition for the lines joining the origin to the points of intersection of the circle $x^2+y^2=a^2$ and the line $lx+my=1$, to coincide.

21. A line makes angles α,β,γ,δ with the four diagonals of a cube. Show that
$\cos^2\alpha+\cos^2\beta+\cos^2\gamma+\cos^2\delta=4/3$

22. Find the derivative of the following w.r.t.x $Cos^{-1}\left(\dfrac{b+a\cos x}{a+b\cos x}\right)(a>b>0)$

23. The tangent at any point P on the curve $x^m y^n = a^{m+n}$ cuts the coordinate axes in A and B. Show that AP: PB is constant.

24. If $y=x\sqrt{a^2+x^2}+a^2\log\left(x+\sqrt{a^2+x^2}\right)$ then show that $\dfrac{dy}{dx}=2\sqrt{a^2+x^2}$

MARCH – 2025
Board of Intermediate Education
Mathematics I(B) 1st Year
SET-1

Time : 3 Hrs   Total Marks : 60 M

SECTION – A

I Answer all the following questions   10x2=20M

1) A straight line L with negative slope passes through the point (8,2) and cuts positive coordinate axis at the points P and Q . Find the minimum value of OP +OQ as L varies , where O is the origin.

2) Find the angle between the lines $\sqrt{3}x + y + 1 = 0 \ and \ x - 1 = 0$

3) Find 'X' if the distance between the points (5,-1, 7) and (x, 5, 1) is 9 units.

4) Find the equation of the plane passes through the point (1,1,1) and parallel to the plane x+2y+3z-7=0.

5) Evaluate $\underset{x \to 3}{Lim} \dfrac{e^x - e^3}{x - 3}$

6) Evaluate $\underset{x \to a}{Lt} \dfrac{\sin(x - a) \tan(x - a)}{(x^2 - a^2)}$

7) If y=sin-1 ($3x-4x^3$) then find dy/dx.

8) If y= sin(tan^{-1}(e^x)) then find dy/dx.

9) Find the approximate value of $\sqrt{82}$.

10) Verify Lagrange's theorem for f(x)=log x on [1,2]

SECTION – B

II Answer any five of the following questions   5x4=20M

11) A(2,3) and B(-3,4) be two given points. find the equation of locus of P, so that the area of the triangle PAB is 8.5.

12) When the origin is shifted to (-1,2) by the translation of axes, find the transformed equation of $x^2+y^2+2x-4y+1=0$

13) If the straight lines ax+ by+ c= 0,bx + cy + a = 0 and cx + ay + b = 0 are concurrent, then prove that $a^3+b^3+c^3=3abc$

14) Find the derivative of cox as from first principle.

15) When the axes are roted through an angle π/6. Find the transformed equation of $x^2+2\sqrt{3}xy-y^2=2a^2$.

16) Let a kind of bacteria grow in such a way that at time 't' sec there are $t^{3/2}$ bacteria. Find the rate of growth at time t= 4 hours.

17) If the slope of the tangent to the curve y=xlog x at a point on it is 3/2 then find the equations of tangent and normal at the point.

III Answer any Five of the following questions   7 x 5 = 35M

18)   Find the circumcenter of the triangle whose vertices are (1,3) (0.-2), (-3,1)

19)   If the equation x=ax²+2hxy+by²+agx+afy+c=0 represents a pair of parallel straight lines, then prove that i) h²=ab ii) af²=bg² and iii) distance between the parallel lines=$2\sqrt{\frac{g^2 - a\,c}{a(a + b)}} = 2\sqrt{\frac{f^2 - b\,c}{b(a + b)}}$

20) Find the angle between the lines joining the origin to the points of intersection of the curve x²+2xy+y²+2x+2y-5=0 and the line 3x-y+1=0

21) A ray makes angles $\alpha,\beta,\gamma,\delta$ with the four diagonals of a cube find $\cos^2\alpha +\cos^2\beta + \cos^2\gamma +\cos^2\delta$.

22) If $x^y=y^x$ then show that $\frac{dy}{dx}=\frac{y(x\log y)- y}{x(y\log x)- x}$.

23) Show that the condition for the orthogonality of the curves ax²+by²=1 and a₁x²+b₁y²=1 is $\frac{1}{a}-\frac{1}{b}=\frac{1}{a_1}-\frac{1}{b_1}$

24)   Find the maximum area of the rectangle that can be formed with fixed perimeter 20.

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