193 (New Syllabus)

II

Total No. of Questions – 24
Total No. of Printed Pages - 3

Regd. No. | | | | | | | | | | |

Part - III
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 **$10 \times 2 = 20$**

I. Very Short Answer Type questions.
(i) Attempt **all** questions.
(ii) Each question carries **two** marks.

1. Find the equation of the straight line passing through the point (5, 4) and parallel to the line $2x + 3y + 7 = 0$.

2. Find the value of P, if the straight lines $x + P = 0$, $y + 2 = 0$, $3x + 2y + 5 = 0$ are concurrent.

3. Show that the points $A = (1, 2, 3)$, $B = (7, 0, 1)$, $C = (-2, 3, 4)$ are collinear.

4. Find the direction cosines of the normal to the plane $x + 2y + 2z - 4 = 0$.

5. Compute $\underset{x \to 0}{\text{Lt}} \left(\frac{a^x - 1}{b^x - 1}\right)$ $(a > b > 0, b \neq 1)$

6. Find $\underset{x \to 0}{\text{Lt}} \left(\frac{e^x - \sin x - 1}{x}\right)$

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

8. If $y = \sec^{-1}\left(\frac{1}{2x^2 - 1}\right)$, find $\frac{dy}{dx}$.

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

10. Let $f(x) = (x - 1)(x - 2)(x - 3)$. Prove that there is more than 1 'c' in (1, 3) such that $f'(c) = 0$.

SECTION – B

$5 \times 4 = 20$

II. Short Answer Type questions.

(i) Attempt any **five** questions.

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

11. Find the equation of locus of p, if the line segment joining (2, 3) and (–1, 5) subtends a right angle at p.

12. Show that the axes are to be rotated through an angle of $\frac{1}{2}\tan^{-1}\left(\frac{2h}{a-b}\right)$ so as to remove the xy term from the equation $ax^2 + 2hxy + by^2 = 0$ if $a \neq b$ and through the angle $\frac{\pi}{4}$, if $a = b$.

13. Find the point on the line $3x + y + 4 = 0$ which is equidistant from the points (–5, 6) and (3, 2).

14. Check the continuity of the following function given by

$$f(x) = \begin{cases} \dfrac{x^2-9}{x^2-2x-3} & \text{if } 0 < x < 5 \text{ and } x \neq 3 \\ 1.5 & \text{if } x = 3 \end{cases}$$

at the point 3.

15. Find the derivative of $\cos ax$ from the first principle.

16. The volume of a cube is increasing at a rate of 9 cubic centimetres per second. How fast is the surface area increasing when the length of the edge is 10 centimetres ?

17. Find the lengths of normal and subnormal at a point on the curve $y = \frac{a}{2}(e^{x/a} + e^{-x/a})$.

SECTION – C

5 × 7 = 35

III. Long Answer Type questions.

(i) Attempt any **five** questions.

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

18. If Q(h, k) is the image of the point $P(x_1, y_1)$ w.r.t. the straight line $ax + by + c = 0$, then $\frac{h - x_1}{a} = \frac{k - y_1}{b} = \frac{-2(ax_1 + by_1 + c)}{a^2 + b^2}$. Find the image of (1, –2) w.r.t. the straight line $2x - 3y + 5 = 0$.

19. Show that the area of the triangle formed by the lines $ax^2 + 2hxy + by^2 = 0$ and $lx + my + n = 0$ is $\left|\frac{n^2\sqrt{h^2 - ab}}{(am^2 - 2hlm + bl^2)}\right|$.

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

21. Find the angle between the lines whose direction cosines satisfy the equations $l + m + n = 0$, $l^2 + m^2 - n^2 = 0$.

22. If $y = (\sin x)^{\log x} + x^{\sin x}$, find $\frac{dy}{dx}$.

23. If the tangent at any point on the curve $x^{2/3} + y^{2/3} = a^{2/3}$ intersects the co-ordinate axes in A and B, then show that the length of AB is a constant.

24. If the curved surface of right circular cylinder inscribed in a sphere of radius R is maximum, show that the height of the cylinder is $\sqrt{2}$ R.