

Total No. of Questions – 24

Regd.

Total No. of Printed Pages – 3

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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 × 2 = 20

I. Very short answer type questions :

(i) Attempt **all** questions.(ii) Each question carries **two** marks.

1. Find the area of the triangle formed by the straight line $3x - 4y + 12 = 0$ with co-ordinate axes.

2. Find the equation of straight line passing through $(-2, 4)$ and making non-zero intercepts whose sum is zero.

3. Find the angle between the planes $2x - y + z = 6$, $x + y + 2z = 7$.

4. If $(3, 2, -1)$, $(4, 1, 1)$, $(6, 2, 5)$ are three vertices and $(4, 2, 2)$ is the centroid of a tetrahedron, find the fourth vertex.

5. Compute $\text{Lt}_{x \rightarrow 0} \frac{a^x - 1}{b^x - 1}$; ($a > 0$, $b > 0$, $b \neq 1$)

6. Find $\text{Lt}_{x \rightarrow 0^+} \left(\frac{2|x|}{x} + x + 1 \right)$

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

8. If $y = ae^{nx} + be^{-nx}$, then prove that $y'' = n^2y$
9. If $y = f(x) = x^2 + x$, $x = 10$, $\Delta x = 0.1$, find Δy , dy .
10. Verify Rolle's theorem of the function $\log(x^2 + 2) - \log 3$ on $[-1, 1]$

SECTION - B

5 × 4 = 20

II. Short answer type questions :

- (i) Attempt any **five** questions.
 - (ii) Each question carries **four** marks.
11. Find the equation of the locus of P, if $A = (2, 3)$, $B = (2, -3)$ and $PA + PB = 8$.
 12. When the axes are rotated through an angle $\pi/6$, find the transformed equation of $x^2 + 2\sqrt{3}xy - y^2 = 2a^2$.
 13. Find the points on the line $3x - 4y - 1 = 0$ which are at a distance of 5 units from the point $(3, 2)$.
 14. Verify the continuity of $f(x)$ given by
$$f(x) = \begin{cases} \frac{x^2 - 9}{x^2 - 2x - 3} & \text{if } 0 < x < 5 \text{ and } x \neq 3 \\ 1.5 & \text{if } x = 3 \end{cases}$$
at the point 3.
 15. Find the derivative of $x \sin x$ from the first principle.
 16. The volume of a cube is increasing at the rate of $8 \text{ cm}^3/\text{sec}$. How fast is the surface area increasing when the length of an edge is 12 cm ?
 17. A particle is moving in a straight line so that after 't' seconds its distance is 'S' (in cms) from a fixed point on the line is given by $S = f(t) = 8t + t^3$. Find (i) the velocity at time $t = 2$ sec (ii) the initial velocity (iii) acceleration at $t = 2$ sec.