



Total No. of Questions : 24

Total No. of Printed Pages : 2

Reg. No. 

**Part – III**  
**MATHEMATICS – Paper – 1 (B)**  
 (English Version)



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|  | Question Booklet SL No. |
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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 distance between parallel lines  $5x - 3y - 4 = 0$  and  $10x - 6y - 9 = 0$ .

2) Show that the points A(3, 2, -4), B(5, 4, -6) and C(9, 8, -10) are collinear.

3) Write the equation of plane  $4x + 4y + 2z + 5 = 0$  in intercepts form.

4) If the increase in side of square is 4%, then find the approximate percentage of increase in the area of square.

5) Transform the equation  $\sqrt{3}x + y + 10 = 0$  in to (i) slope-intercept form (ii) normal form.6) Find the second order derivative of  $y = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$ .7) Find the derivative of  $e^{2x} \cdot \log(3x+4)$  ( $x > \frac{-4}{3}$ ).8) Verify Rolle's theorem for the function  $f(x) = x^2 - 1$  on  $[-1, 1]$ .9) Compute  $\lim_{x \rightarrow 2^+} ([x] + x)$  and  $\lim_{x \rightarrow 2^-} ([x] + x)$ .10) Evaluate  $\lim_{x \rightarrow 0} \left( \frac{3^x - 1}{\sqrt{1+x} - 1} \right)$ .**SECTION – B****(5×4=20)**

II. Short answer type questions.

(i) Attempt **ANY FIVE** questions.(ii) **Each** question carries **FOUR** marks.

11) If  $f$ , given by  $f(x) = \begin{cases} k^2x - k, & x \geq 1 \\ 2, & x < 1 \end{cases}$  is a continuous function on  $\mathbb{R}$ , then find values of  $k$ .

12) Find the derivative of 'sec 3x' from the first principle.

13) 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?

14) Find the lengths of normal and sub-normal at a point on the curve

$$y = \frac{a}{2} \left( e^{\frac{x}{a}} + e^{-\frac{x}{a}} \right).$$

15) Find the equation of locus of 'P', if the ratio of distances from P to A(5, -4) and B(7, 6) is 2 : 3.

16) When the axes are rotated through an angle  $\frac{\pi}{4}$ , find the transformed equation of  $3x^2 + 10xy + 3y^2 = 9$ .

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



### SECTION - C

(5×7=35)

III. Long answer type questions.



(i) Attempt **ANY FIVE** questions.

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

18) Find the orthocentre of triangle formed by the lines  $x + 2y = 0$ ,  $4x + 3y - 5 = 0$  and  $3x + y = 0$ .

19) 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  $3x - y + 1 = 0$ .

20) Show that the area of triangle formed by the lines  $ax^2 + 2hxy + by^2 = 0$  and

$$lx + my + n = 0 \text{ is } \left| \frac{n^2 \sqrt{h^2 - ab}}{am^2 - 2h/m + b/l^2} \right|$$

21) Find the angle between the lines whose direction cosines are given by the equations  $3l + m + 5n = 0$  and  $6mn - 2nl + 5lm = 0$ .

22) If  $x^y + y^x = a^b$ , then show that  $\frac{dy}{dx} = - \left( \frac{y \cdot x^{y-1} + y^x \cdot \log y}{x^y \log x + x \cdot y^{x-1}} \right)$ .

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

24) The profit function  $P(x)$  of a company selling 'x' items per day is given by  $P(x) = (150 - x)x - 1000$ . Find the number of items that the company should manufacture to get maximum profit. Also find the maximum profit.