



(January-2024)

- 7) Let a line passing through the point  $(-1, 2, 3)$  intersect the lines  $L_1 : \frac{x-1}{3} = \frac{y-2}{2} = \frac{z+1}{-2}$  at  $M(\alpha, \beta, \gamma)$  and  $L_2 : \frac{x+2}{-3} + \frac{y-2}{-2} + \frac{z-1}{4}$  at  $N(a, b, c)$ . Then, the value of  $\frac{(a+\beta+\gamma)^2}{(a+b+c)^2}$  equals

(January-2024)

- 8) Consider two circles  $C_1 : x^2 + y^2 = 25$  and  $C_2 : (x - \alpha)^2 + y^2 = 16$ , where  $\alpha \in (5, 9)$ . Let the angle between the two radii (one to each circle) drawn from one of the intersection points of  $C_1$  and  $C_2$  be  $\sin^{-1}\left(\frac{\sqrt{63}}{8}\right)$ . If the length of common chord of  $C_1$  and  $C_2$  is  $\beta$ , then the value of  $(\alpha\beta)^2$  equals

(January-2024)

- 9) Let  $\alpha = \sum_{k=0}^n \left(\frac{{}^nC_k}{k+1}\right)$  and  $\beta = \sum_{k=0}^{n-1} \left(\frac{{}^nC_k \cdot {}^nC_{k+1}}{k+2}\right)$ . If  $5\alpha = 6\beta$ , then  $n$  equals

(January-2024)

- 10) Let  $S_n$  be the sum to  $n$ -terms of an arithmetic progression  $3, 7, 11, \dots$ . If  $40 < \left(\frac{6}{n(n+1)} \sum_{k=1}^n S_k\right) < 42$ , then  $n$  equals

(January-2024)

- 11) In an examination of Mathematics paper, there are 20 questions of equal marks and the question paper is divided into three sections :  $A, B$  and  $C$ . A student is required to attempt total 15 questions taking at least 4 questions from each section. If section  $A$  has 8 questions, section  $B$  has 6 questions and section  $C$  has 6 questions, then the total number of ways a student can select 15 questions is

(January-2024)

- 12) The number of symmetric relations defined on the set  $\{1, 2, 3, 4\}$  which are not reflexive is

(January-2024)

- 13) The number of real solutions of the equation  $x(x^2 + 3|x| + 5|x-1| + 6|x-2|) = 0$  is

(January-2024)

- 14) The area of the region enclosed by the parabola  $(y-2)^2 = x-1$ , the line  $x-2y+4=0$  and the positive coordinate axes is

(January-2024)

- 15) The variance  $\sigma^2$  of the data

$x_i$	0	1	5	6	10	12	17
$f_i$	3	2	3	2	6	3	3

Is

(January-2024)