

PAST QUESTION PAPERS  
FOR  
CLASS – X  
**YEAR – 2018**

**HIGHER MATHEMATICS**

Full Marks – 80

Pass Marks – 20

Time : Three hours

Attempt all questions.

The figures in the right margin indicate full marks for the questions.

For Question nos. 1 to 5, write the letter corresponding to correct answer.

1. The 5th term in the expansion of  $\left(x - \frac{1}{x^2}\right)^{12}$  is: 1  
(A) 495 (B) -495  
(C) 792 (D) -792
  
2. The value of  $\sin(-1530^\circ)$  is: 1  
(A)  $\frac{1}{2}$  (B)  $-\frac{1}{2}$   
(C) 1 (D) -1
  
3. The sum of the cubes of the first  $n$  natural number is: 1  
(A)  $\frac{n(n+1)}{2}$  (B)  $\left\{\frac{n(n+1)}{2}\right\}^2$   
(C)  $\left\{\frac{n(n+1)}{2}\right\}^3$  (D)  $\frac{n(n+1)(2n+1)}{6}$
  
4. Two forces of magnitudes  $P$  and  $2P$  act on a particle in directions inclined at an angle of  $12^\circ$  to each other. The angle between the resultant force and  $P$  is: 1  
(A)  $30^\circ$  (B)  $45^\circ$   
(C)  $60^\circ$  (D)  $90^\circ$
  
5. If  $A = \begin{bmatrix} -1 & -1 \\ k & 2 \end{bmatrix}$  and  $|A| = 4$ , then the value of  $k$  is: 1  
(A) -1 (B) 1  
(C) 2 (D) 0

6. What is meant by an algebraic structure ? 1
7. If  $P(n)$  be the statement " $n^2 > 10$ ", prove that  $P(k)$  is true  $\Rightarrow P(k+1)$  is true. 1
8. What is meant by an algebraic identity ? 1
9. Define an upper triangular matrix. 1
10. If a Matrix  $A$  has 5 elements, what are the possible types  $A$  can be of ? 1
11. IF ABCD is a cyclic quadrilateral, prove that  $\sin A = \sin C$ . 1
12. State Parallelogram of forces. 1
13. The resultant of two equal forces  $P$  and  $P$  is of magnitude  $\sqrt{3} P$ . Find the angle between the forces. 1
14. Prove that the binary operation  $*$  on  $\mathbb{R}$  defined by  $a * b = a + b + 1 \forall a, b \in \mathbb{R}$  is associative. 2
15. Insert two arithmetic means between  $a$  and  $b$ . 2
16. Find the term containing  $x^9$  in the expansion of  $\left(x^2 - \frac{1}{x}\right)^9$  2
17. Find a matrix  $C$  such that  $A + B + 2C = 0$ , where  $A = \begin{bmatrix} -3 & 4 \\ 0 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} -1 & 2 \\ -2 & -5 \end{bmatrix}$ . 2
18. Evaluate :  $\sin^2 \frac{\pi}{4} + \sin^2 \frac{3\pi}{4} + \sin^2 \frac{5\pi}{4} + \sin^2 \frac{7\pi}{4}$  2
19. If the  $p^{\text{th}}$  term of an H.P. be  $q$  and the  $q^{\text{th}}$  term be  $p$ , prove that  $(p + q)$ th term is  $\frac{pq}{p+q}$  3
20. If  $A = \begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}$ , find a matrix  $B$  such that  $AB = I$  3
21. If  $a + b + c = 0$  prove that  $(ab + bc + ca)^2 = \frac{1}{2}(a^2 + b^2 + c^2)^2$  3
22. Prove that  $a^2x + b^2y + c^2z = (x + y + z)(a^2 + b^2 + c^2)$ , If  $a^2 = x^2 - yz$ ,  $b^2 = y^2 - zx$  and  $c^2 = z^2 - xy$ . 3

23. Find the principal solutions of  $\cos \theta + \sqrt{3} \sin \theta = 2$  3
24. Let R be a given force. If OX and OY be two given directions making angles  $\alpha$  and  $\beta$  respectively with R, on opposite sides of it, write down the components of R along OX and OY. Hence obtain the resolved parts of R along and perpendicular to OX. 3

25. Prove by using the principle of mathematical induction that  $\forall n \in \mathbb{N}$ ,

$$1 + 2 + 3 + \dots + n < \frac{1}{8} (2n + 1)^2. \quad 4$$

**Or**

$a^n - b^n$  is divisible by  $a - b$ .

26. Construct the composition table for the set  $S = \{1, 2, 3, 4, 5, 6\}$  with respect to the binary operation of multiplication modulo 7. From the table, find the identity element and the inverse of each element of S. 4
27. Prove that every square matrix can be expressed uniquely as the sum of a symmetric matrix and a skew-symmetric matrix. 4
28. State and prove Binomial Theorem for a positive integral index. 5
29. Find the trigonometric ratios of  $270^\circ + \theta$  in terms of those of  $\theta$ . 5
30. Factorise :  $x(x - 2)(2x + 1)(2x - 3) - 03$ .

**Or**

$$x^4 + 4x^3y - 10x^2y^2 + 4xy^3 + y^4.$$

31. 150 workers were engaged to finish a piece of work in a certain number of days. 4 workers dropped the second day, 4 more workers dropped the third day and so on. It takes 8 more days to finish the work now. Find the number of days in which the work was completed. 6
32. Three forces 3P, 7P and 5P act at a point in directions parallel to the sides AB, BC and CA of an equilateral  $\triangle ABC$ . Find the magnitudes of the resultant and the angle made by the resultant with BC. 6

**Or**

The resultant of two forces P and Q is  $\sqrt{3} Q$  at an angle  $30^\circ$  with P. Show that either  $P = Q$  or  $P = 2Q$ .