

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 120° to each other. The angle between the resultant force and P is: 1
(A) 30° (B) 45°
(C) 60° (D) 90°
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^{th} term of an H.P. be q and the q^{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 α and β 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 θ . 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° with P. Show that either $P = Q$ or $P = 2Q$.