

Sample Paper – 2011
Class – XI
Subject - Mathematics

Max Time: 03 h

Max Marks: 100

- General Instructions:**
- i. All questions are compulsory.
 - ii. The question paper consists of 29 questions divided in to three sections A, B and C. Section A comprises of 10 questions of 1 mark each, Section B comprises of 12 questions of 4 marks each and Section C comprises of 7 questions of 6 marks each.
 - iii. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
 - iv. There is no over all choice. However, internal choice has been provided in 4 questions of four marks each and 3 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
 - v. Use of calculators is not permitted

Section – A

1. Find the value of the trigonometric function: $\cot\left(-\frac{15\pi}{4}\right)$.
2. A function f is defined by $f(x) = 2x - 5$. Find $f(-3)$.
3. Find the coefficient of x^6y^3 in the expansion of $(x + 2y)^9$.
4. Find n, if ${}^{n-1}P_3 : {}^nP_4 = 1 : 9$.
5. Solve: $\frac{x}{4} < \frac{5x - 2}{3} - \frac{7x - 3}{5}$.
6. Find the equation of the parabola with vertex at $(0, 0)$ and focus at $(0, 2)$.
7. Express the complex number $z = \frac{2 + i}{(1 + i)(1 - i)}$ in $(x + iy)$ form.
8. Find the 12th term of a G.P. whose 8th term is 192 and the common ratio is 2.
9. If E and F are events such that $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ and $P(E \text{ and } F) = \frac{1}{8}$, find $P(E \text{ or } F)$.
10. Evaluate: $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x}$.

Section – B

11. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and $B = \{2, 3, 5, 7\}$.
Verify that $(A \cup B)' = A' \cap B'$

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12. If $\left(\frac{1+i}{1-i}\right)^m = 1$, then find the least integral value of m .

(OR) Express $z = \frac{(3 + i\sqrt{5})(3 - i\sqrt{5})}{(\sqrt{3} + i\sqrt{2}) - (\sqrt{3} - i\sqrt{2})}$ in the form of $a + ib$.

13. Using Binomial Theorem, prove that: $\sum_{r=0}^n 3^r \cdot {}^n C_r = 4^n$.

14. If $\sin x = \frac{3}{5}$, $\cos y = -\frac{12}{13}$, where x and y both lie in II quadrant, find the value $\sin(x + y)$.

(OR) Prove that: $\frac{1 + \sin \theta - \cos \theta}{1 + \sin \theta + \cos \theta} = \tan\left(\frac{\theta}{2}\right)$.

15. Prove the following by using the Principle of Mathematical Induction

$$\frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \dots + \frac{1}{2^n} = 1 - \frac{1}{2^n} \quad \forall n \in \mathbb{N}.$$

16. In how many ways can 5 persons travel in a car, 2 including driver in the front seat and 3 in the back seat, if 2 particular persons out of the 5 do not know driving?

17. Prove by PMI that “ $n(n + 1)(n + 5)$ is always a multiple of 3 for every natural number n ”.

18. Find the equation of the hyperbola with vertices at $(\pm 5, 0)$ and foci at $(\pm 7, 0)$.

(OR) Find the coordinates of the point which divides the line segment joining the points

$(-2, 3, 5)$, & $(1, -6, 6)$ in the ratio 2 : 3 internally.

19. Find the equation of the line making equal intercepts on the axes and making an angle 135° with X axis.

(OR) Find the coordinates of the foci, the vertices, the length of major axis and eccentricity of the ellipse $\frac{x^2}{49} + \frac{y^2}{36} = 1$

20. State the Converse and Contra positive of the below atatements
- A quadrilateral is a parallelogram only if its opposite sides are equal
 - A cadet joins NDA if he clear the SSBinterview and Medical test
21. If the sum of n terms of a AP is $3n^2 + 5n$ and its m^{th} term is 164, find the value of m.
22. In a game a fair die is thrown. Game is won if multiple of 3 appears. Otherwise the die is thrown again. Write the sample space with atleast 12 outcomes.

Section – C

23. Solve the following system of inequations graphically
 $2x + y \leq 24$; $x + y \leq 11$; $2x + 5y \leq 40$; $x \geq 0$; $y \geq 0$.
24. If the 21st & 22nd terms in the expansion of $(1 + x)^{44}$ are equal, then find the value of x.
(OR) If a, b, c are in A.P. ; b, c, d are in G.P. and $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in A.P. , prove that a, c, e are in G.P.
25. Find the area of the triangle formed by the midpoints of sides of the triangle whose vertices are (2 , 1), (- 2, 3), (4 , - 3).
(OR) Find the equation of the line through the intersection of lines $3x + 4y = 7$ and $x - y + 2 = 0$ and whose slope is 5.
26. Calculate the mean deviation about mean for the following data:

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
Frequenc y	6	7	15	16	4	2

27. Compute the derivative of $\tan x$ using the first principle
28. Find the general solution of the equations
- $\sec^2 2x = 1 - \tan 2x$
 - $\sin x + \sin 3x + \sin 5x = 0$
- (OR)** If $\tan x = \frac{3}{4}$, where x is in III quadrant, find te value of $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$.
29. i) In a survey of 600 cadets in a school, 150 students were found to be interested in joining IAF and 125 interested in joining **only** IN. Find how many students were interested neither in IAF nor in IN?
 ii) Show by Venn diagram that, $A - B = A \cap B'$