

MATHEMATICS

Class XI

Time - 3 Hrs

MM - 100

Important Instructions:

1) All Questions are compulsory.

2) The Question Paper consists of 29 questions divided into 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.

Section C comprises of 07 questions of 6 marks each.

3) There is no overall choice. However, internal choice has been provided in some questions in section B and section C only.

You have to attempt only one of the alternatives in all such questions.

4) Use of calculators is not permitted.

Section A

~~Set~~

1. If $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{3, 4, 5, 6, 7, 8\}$. Find $(A-B) \cup (B-A)$.

~~set~~

2. Draw the Venn Diagram of $A' \cap (B \cup C)$.

~~Function~~
3. If $\left(\frac{a}{3} + 1, b - \frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$, Find the value of a and b.

~~Trigono.~~

4. Evaluate $\cot\left(-\frac{15\pi}{4}\right)$

5. Evaluate $i^{104} + i^{109} + i^{114} + i^{119}$; where $i = \sqrt{-1}$.

~~Complex~~

Limit

6. Evaluate $\lim_{x \rightarrow 0} \frac{\sin 5x}{\sin 3x}$

Limit

7. If $f(x) = \frac{x^{100}}{100} + \frac{x^{99}}{99} + \frac{x^{98}}{98} + \dots + \frac{x^2}{2} + x + 1$, find $f'(1)$.

8. Write the contra positive of the following statement

*Math
Reas* "I go to a beach whenever it is a sunny day."

9. Find the components of the following statement

*Math
Reas* "100 is divisible by 3, 11 and 5"

10. A coin is tossed, if the outcome is a head, a die is thrown. If the die shows up an even number, a coin is tossed again. Find the sample space.

Section B

Function
11. Find the domain and range of the function $y = \sqrt{(x-1)(3-x)}$

12. Let $A = \{1, 2, 3, \dots, 13, 14\}$. Define a relation R from A to A by $R = \{(x, y) : 3x - y = 0 \text{ where } x, y \in A\}$.

Function
Write down the relation R, domain and range.

13. Prove that $\tan 4\theta = \frac{4 \tan \theta (1 - \tan^2 \theta)}{1 - 6 \tan^2 \theta + \tan^4 \theta}$

OR

Prove that $\frac{\cos 8A \cos 5A - \cos 12A \cos 9A}{\sin 8A \cos 5A + \cos 12A \sin 9A} = \tan 4A$

~~For~~ 14. Solve the trigonometric equation $\sqrt{3}\cos\theta + \sin\theta = \sqrt{2}$

~~Sept~~ 15. If $A = \{1, 2, 3\}$, $B = \{4, 5, 6\}$, $C = \{7, 8, 9\}$

Verify that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

16. If $(x + iy)^3 = u + iv$ then show that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$

~~Complex~~

OR

Solve the equation $x^2 - 7ix - 12 = 0$

17. Find the coefficient of x^5 in the product of $(1 + 2x)^6(1 - x)^7$ using binomial theorem.

~~Permutation~~

18. In an examination, a question paper consists of 12 questions divided into two parts part A and part B containing 5 and 7 questions respectively. A student is required to attempt 8 questions, attempting at least three questions from each part. In how many ways can a student select the questions?

19. Find the distance of the line $4x + 7y + 5 = 0$ from the point $(1, 2)$ along the line $2x - y = 0$.

~~3-D~~

OR

Find the equation of the line passing through the intersection of $x + 2y = 5$ and $x - 3y = 7$ and passing through the point $(0, -1)$.

20. Differentiate $\sin x$ by ab-initio(first principle) method.

Ans

OR

Differentiate the following w.r.t x

$$y = \frac{\sec x + \tan x}{\sec x - \tan x}$$

21. Find the ratio in which the YZ plane divides the line segment formed by joining the points $(-2,4,7)$ and $(3,-5,8)$. *3-D*

22. Three cards are drawn at random from a well shuffled pack of 52 cards. Find the probability that *Probability*

- O
- I. All three cards are of the same suit.
 - II. One is a king, the other is a queen and the third is a jack.

Section - C

23. A survey of 500 television viewers produced the following information, 285 watch football, 195 watch hockey, 115 watch basketball, 45 watch football and basketball, 70 watch football and hockey, 50 watch hockey and basketball, 50 do not watch any of the three games. *Set*

(1) How many watch all the three games?

(2) How many watch exactly one of the three games? *225*

24. Prove the following by mathematical induction method. *Induction*

$$\frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \dots + \frac{1}{(2n+1)(2n+3)} = \frac{n}{3(2n+3)}$$

OR

Show by mathematical induction method that

$3^{2n+2} - 8n - 9$ is divisible by 8

25. ~~Solve graphically~~ $2x + y \geq 4, x + y \leq 3, 2x - 3y \leq 6$ *Line on*
26. ~~The coefficient of $(r - 1)$ th, r th and the $(r+1)$ th terms in the expansion of $(x + 1)^n$ are in the ratio 1:3:5. Find both n and r .~~ *Series*
27. ~~Find the sum of the first n terms of the series.~~

$3 + 7 + 13 + 21 + 31 + \dots$

Series

OR

Show that the sum of the following series up to n terms

$$\frac{1 \times 2^2 + 2 \times 3^2 + 3 \times 4^2 + 4 \times 5^2 + \dots}{1^2 \times 2 + 2^2 \times 3 + 3^2 \times 4 + 4^2 \times 5 + \dots} = \frac{3n+5}{3n+1}$$

28. ~~Find the co-ordinates of the foci, the vertices, the eccentricity and the length of the latus rectum of the hyperbola $9x^2 - 16y^2 = 144$~~ *Ellipses*
29. ~~Calculate the mean, variance and standard deviation from the following data.~~

Marks	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90
No. of Students	3	6	13	15	14	5	4
		Statics					

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