

INDIANSCHOOL SOHAR
SECOND TERM EXAM – 2015
MATHEMATICS

STD: XI
DATE: 29 .11.15

MARKS: 100
TIME: 3Hrs

GENERAL INSTRUCTIONS

1. *All questions are compulsory.*
 2. *The question paper consists of 26 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, section B comprises of 13 questions of four marks each and section C comprises of 7 questions of six marks each.*
 3. *All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.*
 4. *There is no overall choice. However, an internal choice has been provided in 4 questions of four marks each and 2 questions of six mark each. You have to attempt only one of the alternatives in all such questions.*
 5. *Use of calculators is not permitted.*
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SECTION - A

1. Find the ratio in which the Y-Z plane divides the line segment formed by joining the points (4, 8, 10) and (6, 10, -8).
2. Name the octants in which the following points lie: A(3,5,-1), B(-2,-7,4) , C(2,-3, -3) and D (-5, 2,-7)
3. Identify the quantifier in the following statements and write the negation of the statement. “For every real number x , x is less than $x + 1$ ”.
4. State whether the “Or” used in the following statements is “exclusive “or” inclusive. Give reasons for your answer. “Students can take Arabic or Sanskrit as their third language”.
5. Evaluate: $\operatorname{cosec} \left(\frac{-19\pi}{3} \right)$
6. Find a and b such that $2a + 4ib$ and $2i$ represent the same complex number.

SECTION – B

7. Prove the following by using the principle of mathematical induction for all $n \in N$:
 $(1 + x)^n \geq (1 + nx)$, where $x > -1$

8. Convert the following in the polar form: $\frac{1+7i}{(2-i)^2}$

OR

Find real θ such that $\frac{3+2i \sin\theta}{1-2i \sin\theta}$ is purely real.

9. How many numbers greater than 10,00,000 can be formed by using the digits 1,2,0,2,4,2,4?

OR

There are how many rectangles in a chess board? Of these how many are square?

10. Five balls of different colours are to be placed in three boxes of different sizes. Each box can hold five balls. In how many different ways can we place the balls, so that no box remains empty?

11. Between 1 and 31, m numbers have been inserted in such a way that the resulting sequence is an A. P. and the ratio of 7th and $(m-1)$ th numbers is 5 : 9. Find the value of m .

OR

Find the value of n so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be the geometric mean between a and b .

12. Show that the sum to n terms of the following series:

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

13. If $A = \{x / x \in \mathbb{Z}, x^2 < 16\}$, $B = \{x : x \text{ is prime number less than } 13\}$,

$C = \{x; x \in \mathbb{Z}, -2 \leq x \leq 2\}$. Find i) $A \cap C$ ii) $A - B$ iii) $(B \cup C) \cap A$

14. Find the derivative of $\sqrt{\cos x}$ by first principle

15. Find the domain and the range of the real function f defined by $f(x) = \frac{3}{2-x^2}$

16. Find the equation of the line through the point of intersection of the lines $4x + 7y - 3 = 0$ and $2x - 3y + 1 = 0$, that has equal intercepts on the axes.

17. Evaluate the following limit: $\lim_{x \rightarrow 0} \frac{x(e^{2x}-1)}{1-\cos x}$

OR

Find $\lim_{x \rightarrow 0} f(x)$ where $f(x) = \begin{cases} \frac{x}{|x|}, & \text{if } x \neq 0 \\ 0, & \text{if } x = 0 \end{cases}$

18. Solve: $\sin 2x - \sin 4x + \sin 6x = 0$

19. In any triangle ABC, show that: $\frac{c-b \cos A}{b-c \cos A} = \frac{\cos B}{\cos C}$

SECTION – C

20. Prove that: $\cos \frac{2\pi}{7} + \cos \frac{4\pi}{7} + \sin \frac{6\pi}{7} = \frac{-1}{2}$

OR

$$\frac{\sin 8x \cos x - \cos 3x \sin 6x}{\cos 2x \cos x - \sin 3x \sin 4x} = \tan 2x$$

21. Solve the following system of inequalities graphically:

$$x - 2y \leq -3, \quad 2x + y \geq 6, \quad x < 3, \quad x \geq 0, \quad y \geq 0$$

22. In a class, 18 students took Physics, 23 students took Chemistry and 24 students took Mathematics. Of these 13 took both Chemistry and Mathematics, 12 took both Physics and Chemistry and 11 took both Physics and Mathematics. If 6 students offered all the three subjects find : i) total number of students in the class ii) how many took exactly one of the subjects?

23. The coefficients of three consecutive terms in the expansion of $(1 + a)^n$ are in the ratio 1 : 7 : 42. Find n .

OR

The second, third and fourth terms in the binomial expansion $(x + a)^n$ are 240, 720 and 1080, respectively. Find x , a and n .

24. Find the image of the point P(-8,12) with respect to the line mirror $4x + 7y + 13 = 0$

25. Find the equation of the circle passing through the point (2,-2), (3, 4) and whose centre is on the line $x + y = 1$.

26. i) Find the equation of the hyperbola satisfying the given condition:

foci($\pm 4, 0$), the latus rectum is of length 12.

ii) find the area of the triangle formed by the lines joining the vertex of the parabola $x^2 = 12y$ to the ends of its latus rectum.

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