

INDIANSCHOOL SOHAR
SECOND TERM EXAM – 2014
MATHEMATICS

STD: XI
DATE: 07 .12.14

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.

SECTION - A

1. Evaluate: $\tan 720^0 - \cos 270^0 - \sin 150^0 \cos 120^0$
2. Find the real values of x and y if $(1 - i)x + (1 + i)y = 1 - 3i$
3. Find the distance of the point $(1, 5, 2)$ from Z- axis.
4. Find the image of $(-5, 4, -3)$ in the xz- plane.
5. Write the component statements of the following statement. Also check whether the compound statement is true or false: "All rational numbers are real and all real numbers are not complex".
6. For the following statement, determine whether an inclusive "OR" or exclusive "OR" is used. Give reason for your answer.
"To enter a country, you need a passport or a voter registration card".

SECTION – B

7. Evaluate the following limit: $\lim_{x \rightarrow 0} \frac{x(e^{2x} - 1)}{1 - \cos x}$
8. Solve: $\operatorname{cosec} x = 1 + \cot x$
9. In any triangle ABC, show that :

$$(a - b)^2 \cos^2 \frac{C}{2} + (a + b)^2 \sin^2 \frac{C}{2} = c^2$$

10. Prove the following by using the principle of mathematical induction for all $n \in N$:

$$\sin x + \sin 2x + \sin 3x + \dots + \sin nx = \frac{\sin \frac{(n+1)x}{2} \sin \frac{nx}{2}}{\sin \frac{x}{2}}$$

11. Find the square root of the following: $-5 + 12i$

OR

Show that a real value of x will satisfy the equation $\frac{1-ix}{1+ix} = a - ib$ if $a^2 + b^2 = 1$, where a, b are real.

12. In how many ways can the letters of the word 'PERMUTATIONS' be arranged if

i) there are always 5 letters between P and S?

ii) Vowels are always together?

OR

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

13. A candidate is required to attempt 6 out of 10 questions which are divided into groups each containing 5 questions; he is not permitted to attempt more than 4 questions from each group. In how many ways can he make up his choice?

14. If a is the AM of b and c and the two geometric means are G_1 and G_2 , then prove that $G_1^3 + G_2^3 = 2abc$

OR

150 workers were engaged to finish a job in a certain number of days. 4 workers dropped out on second day, 4 more workers dropped out on third day and so on. It took 8 more days to finish the work. Find the number of days in which the work was completed.

15. Find the sum of the following series up to n terms: $5 + 7 + 13 + 31 + 85 + \dots$

16. If $A = \{x: x \in N, 7 < x \leq 17\}$, $B = \{x: x \text{ is prime number less than } 11\}$,

$C = \{x: x \in Z, -3 \leq x \leq 3\}$. Find i) $A \cap B$ ii) $C - B$ iii) $(B \cup C) \cap A$

17. Find the derivative of $\sin(x^2)$ by first principle

OR

$$\text{Find } \lim_{x \rightarrow 0} f(x) \text{ where } f(x) = \begin{cases} \frac{x-|x|}{x}, & \text{if } x \neq 0 \\ 2, & \text{if } x = 0 \end{cases}$$

18. Find the domain and the range of the real function f defined by $f(x) = \frac{x^2}{1+x^2}$

19. Find the distance of the point $(2,3)$ from the line $2x - 3y + 9 = 0$ measured along a line $x - y + 1 = 0$

SECTION – C

20. 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, 20 watch all the three games. How many do not watch any of the three games? How many watch exactly one of the three games? State two importances of sports in our life.

21. Prove that $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$

OR

$$\sin^2 A = \cos^2 (A - B) + \cos^2 B - 2 \cos(A - B) \cos A \cos B$$

22. Solve the following system of inequalities graphically:

$$x - 2y \leq -1, \quad 2x + y \geq 3, \quad y < 3$$

23. Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in

the expansion $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$ is $\sqrt{6} : 1$.

OR

Prove that the coefficient of x^n in $(1+x)^{2n}$ is twice the coefficient of x^n in $(1+x)^{2n-1}$.

24. In what ratio is the line segment joining (1,-1) and (0,1) divided by the line joining (1,-2) and (-3,4).

25. Find the coordinate of the foci, the vertices, the eccentricity and the length of latus rectum of the conic: $16x^2 - 9y^2 = 576$

26. A beam is supported at its ends by supports which are 12m apart. Since the load is concentrated at its centre, there is a deflection of 3cm at the centre and the deflected beam is in the shape of a parabola. How far from the centre is the deflection 2cm? Describe the importance of studying conic section.

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