



INDIAN SCHOOL SOHAR
TERM II EXAMINATION (2017 -2018)
MATHEMATICS

Class: XI
Date: 26/11/2017

Time: 3 Hrs
Max. Marks: 100

General Instructions

- a. All questions are compulsory.
- b. The question paper consist of 29 questions divided into four sections A, B,C and D. Section A comprises of 4 questions of one mark each, section B comprises of 8 questions of two marks each and section C comprises of 11 questions of four marks each. And section D comprises of 6 questions of six marks each.
- c. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- d. There is no overall choice. However, internal choice has been provided in 03 questions of four marks each and 03 questions of six mark each. You have to attempt only one of the alternatives in all such questions.
- e. Use of calculators is not permitted.

SECTION A

1. If $A = \{ 1, 3, 5, 7 \}$, $B = \{ 2, 5 \}$ find the number of relations from A to B
2. If $1 - i$ is a root of the equation $x^2 + bx + c = 0$ where b and c are real numbers, find the value of b and c
3. Solve the inequality $|7x - 2| \leq 11$
4. Find the truth value of the statement “ honesty is the best policy or $3 < 7$ “

SECTION B

5. Let A and B be two finite sets such that $n(A - B) = 15$, $n(A \cup B) = 90$, $n(A \cap B) = 30$. Find $n(B)$
6. Show that $\sec^2 \theta + \operatorname{cosec}^2 \theta \geq 4$
7. Find the number of ways in which 8 boys and 5 girls can be arranged in a row so that no two girls are together
8. Find the sum to infinity of the G.P $-5/4, 5/16, -5/64 \dots$
9. Find the equation of the angle bisectors of the co ordinate axes.
10. A circle of radius 2 cm lies in the first quadrant and touches both the axes .Find the equation of the circle whose centre is $(6, 5)$ and touching then above circle externally

11. Find the ratio which the line segment joining the points $(4, 8, 10)$ and $(6, 10, -4)$ divided by the YZ plane.
12. Check whether the following statement is true or false by proving its contra positive “ If the positive integers x and y such that xy is odd , the both x and y are odd “

SECTION C

13. Using the properties of sets prove the following i) $A - (A \cap B) = A - B$
 ii) $(A \cup B) - C = (A - C) \cup (B - C)$

14. find the domain and range of the real function $\sqrt{7-x} + \frac{3}{\sqrt{x^2-4}} + 9$

[OR]

Draw the graph of the following function $f(x) = |1-x| + |1+x|$. $-2 \leq x \leq 2$

15. Show that $\sin \frac{\pi}{4} \sin \frac{3\pi}{4} \sin \frac{5\pi}{4} \sin \frac{7\pi}{4} \sin \frac{9\pi}{4} \sin \frac{11\pi}{4} \sin \frac{13\pi}{4} = \frac{1}{64}$

[OR]

Prove that $(1 + \sec 2\theta) (1 + \sec 4\theta) (1 + \sec 8\theta) \dots (1 + \sec 2^n \theta) = \tan 2^n \theta \cot \theta$

16. By Using principle of mathematical induction prove that

$$\left(1 + \frac{3}{1}\right) \left(1 + \frac{5}{4}\right) \left(1 + \frac{7}{9}\right) \dots \left(1 + \frac{2n+1}{n^2}\right) = (n+1)^2, n \in N$$

[OR]

Prove the following by mathematical induction

$$\frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{2n} > \frac{13}{24}, n > 1 \text{ and } n \in N$$

17. Find the centre and radius of the circle represented by , $\left| \frac{Z-3}{Z+3} \right| = 2$ where Z is a complex number

18. If all the permutations of the letters of the word INDIA are arranged as in a dictionary , what are the 14th , 49th , 50th and 60th words ?

19. Find the value of $(a^2 + \sqrt{a^2-1})^4 + (a^2 - \sqrt{a^2-1})^4$

20. If a, b, c are in AP b, c, d are in GP and $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in AP .Prove that a, c, e are in GP

21. An arch in the form of a parabola with its axis vertical . The arch is 10 m high and 5 m wide at the base . How wide is it 2m from the vertex of the parabola ?
22. Find the points which is equidistant from the points $(2, 1, 2)$, $(1, -1, 0)$ and $(3, 2, -1)$, when the required point on the i) YZ plane and ii) XY plane
23. Find the distance of the line $4x + 7y + 5 = 0$ from the point $(1, 2)$ along the line $2x - y = 0$

SECTION C

24. In any triangle ABC , show that $a^2 \cos(B - C) + b^2 \cos(C - A) + c^2 \cos(A - B) = 3abc$

[OR]

In a triangle ABC, $\cos A + 2 \cos B + \cos C = 2$, prove that the sides of the triangle are in AP

25. If P be the sum of odd terms and Q be the sum of even terms in the expansion of $(x + y)^n$ then prove that i) $(x^2 - y^2)^n = P^2 - Q^2$ ii) $(x+y)^{2n} - (x-y)^{2n} = 4PQ$
iii) $(x + y)^{2n} + (x - y)^{2n} = 2(P^2 + Q^2)$

[OR]

Find a, b and n in the expansion of $(a + b)^n$ if the first three terms of the expansion are 729, 7290 and 30375, respectively.

26. Derive the standard equation of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and hence find the foci , eccentricity ,

length of the latus rectum and length of the axes of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$

27. Graphically solve the system of linear inequalities $x + y - 4 \geq 0$, $x + y - 8 \leq 0$, $x \leq 5$, $y \leq 5$,
 $x, y \geq 0$
28. If one diagonal of a square is along the line $8x - 15y = 0$. and one of its vertex is at $(1, 2)$, find the equation of the sides of the square passing through the vertex.

[OR]

Find the area of the parallelogram formed by the lines $x \cos \alpha + y \sin \alpha = p$,

$x \cos \alpha + y \sin \alpha = q$, $x \cos \beta + y \sin \beta = r$ and $x \cos \alpha + y \sin \alpha = s$

29. In a pollution study of 1500 Indian rivers the following data were reported. 520 were polluted by sulphur compounds, 335 polluted by phosphate , 425 polluted by crude oil, 100 were polluted by both crude oil and sulphur compounds , 180 were polluted by both sulphur compounds and phosphate , 150 were polluted by both phosphates and crude oil. How many rivers were polluted by exactly one of these impurities if 878 rivers were declared as polluted rivers.