INDIAN SCHOOL SOHAR
FINAL EXAM – 2015-16
MATHEMATICS

STD: XI
DATE: 06.03.16

MARKS: 100
TIME: 3Hrs

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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. Find the ratio in which the line segment joining the points (4, 8, 10) and (6, 10, – 8) is divided by the YZ-plane.

2. Name the octants in which the following points lie:

   (1,- 2, 3), (- 4, –2, 3), (4, –2, –5), (4, 2, –5)

3. Write the contrapositive of the following statement:

   "If a triangle is equilateral, it is isosceles".

4. For the following statements, determine whether an inclusive "Or" or exclusive "Or" is used. Give reasons for your answer.

   "The school is closed if it is a holiday or a Sunday".

5. If $4x + i(3x – y) = 3 + i(– 6)$, where x and y are real numbers, then find the values of x and y.

6. The minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minutes?
   (Use $\pi = 3.14$).

SECTION – B

7. Prove that for any real numbers x and y, cos x = cos y, implies $x = 2n\pi \pm y$, where $n \in Z$

8. In any $\Delta ABC, prove\ that: sin\left(\frac{B-C}{2}\right) = \frac{b-c}{a}\cos\frac{A}{2}$

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

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

10. Let A, B, and C be the sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Show that B = C.

11. Find the domain and the range of the real function f defined by $f(x) = \sqrt{16 - x^2}$

12. Show that : $\dfrac{1 \times 2^2 + 2 \times 3^2 + \cdots \ldots + n \times (n+1)^2}{1^2 \times 2 + 2^2 \times 3 + \cdots . + n^2 \times (n+1)} = \dfrac{3n+5}{3n+1}$

OR

The difference between any two consecutive interior angle of a polygon is 5^0. If the smallest angle is 120^0, find the number of the sides of the polygon.

13. If p , q ,r are in G.P. and the equations, $px^2 + 2qx + r = 0$ and $d\,x^2 + 2ex + f = 0$ have a common root, then show that $\dfrac{d}{p}, \dfrac{e}{q}, \dfrac{f}{r}$ are in A.P.

14. If $Z = x + iy$, prove that $|x| + |y| \le \sqrt{2}|Z|$

OR

Convert the complex number $z = \dfrac{-16}{1 + i\sqrt{3}}$ into the polar form.

15. Find the derivative of $f(x) = x \sin x$ from the first principle with respect to x.

OR

Evaluate: $\lim\limits_{x \to 0} \dfrac{1 - \cos x \sqrt{\cos 2x}}{x^2}$

16. Find the equation of the line through the point (4, 5) and make equal angles with the lines 5x -12y +6 =0 and 3x= 4y +7.

17. If 4-digit numbers greater than 5000 are randomly formed from the digits 0,1,3,5 and 7, what is the probability of forming a number divisible by 5 when, the repetition of digits is not allowed?

OR

Twelve balls are distributed among three boxes , find the probability that the first box will contain three balls.

18. The letters of the word 'MOTHER' are written in all possible orders and these words are written out as in a dictionary. Find the rank of the word 'MOTHER'.

19. How many words can be formed by taking 4 letters at a time out of the letters of the word "MATHEMATICS".

SECTION – C

20. In a town of 10,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newspaper C. 5% families buy A and B, 3% families buy B and C and 4% families buy A and C. If 2% families buy all the three newspapers, find the number of families which buy i) A only ii) B only iii) none of A, B and C. Mention any 2 importance of reading newspaper every day.

21. Solve the following system of inequalities graphically:

$x \geq 0, y \geq 0, 3x + 2y \leq 150, x + 4y \leq 80, x \leq 20$

22. 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

The 3rd, 4th and 5th terms in the expansion of (x+a) ^{n} are respectively 84,280 and 560.

Find the values of x, a and n.

23. Find the coordinate of the foci, the vertices, the length of major axis, the minor axis, the eccentricity and the length of latus rectum of the conic: $3x^2 + 2y^2 = 18$.

24. Find the points on the line x + y = 4 which lie at a unit distance from the line 4x+3y = 10.

25. Prove that : $2cos\frac{\pi}{13}cos\frac{9\pi}{13} + cos\frac{3\pi}{13} + cos\frac{5\pi}{13} = 0$

OR

Prove that: $sin^2 x + sin^2\left(x + \frac{\pi}{3}\right) + sin^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$

26. Calculate mean and standard deviation for the following distribution.

Classes	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 - 100
Frequency	3	7	12	15	8	3	2

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