INDIAN SCHOOL SOHAR
FIRST TERM EXAMINATION– 2015
SUBJECT: MATHEMATICS

STD: XI **MARKS: 100**
DATE: 17.09.15 **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 marks each. You have to attempt only one of the alternatives in all such questions.*
5. *Use of calculators is not permitted.*

SECTION – A

1. If there are 6 periods in each working day of a school, in how many ways can one arrange 5 subjects such that each subject is allowed at least one period?
2. Find the conjugate of $\frac{1}{3-4i}$
3. Write the set A = {x / x$\in$ Z, $x^2 < 25$} in roaster form.
4. Evaluate : $\sin\left(\frac{-11\pi}{4}\right)$
5. Write the converse of the statement: If x is a prime number, then x is odd.
6. State the contrapositive of the statement: If a triangle is equilateral, it is isosceles.

SECTION – B

7. Find the domain and range of the function f (x) = $\frac{1}{\sqrt{9-x^2}}$

8. 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.

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

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

$$1+\frac{1}{1+2}+\frac{1}{1+2+3}+...+\frac{1}{1+2+3+4...n}=\frac{2n}{n+1}$$

OR

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

$1 + 2 + 3 + ... + n < \frac{1}{8}(2n+1)^2$

11. If p and q are different complex numbers with $|q| = 1$, then find $\left|\frac{q-p}{1-\bar{p}q}\right|$

12. Find the square root of the following: $-2 + 2\sqrt{3}\,i$

13. Show that for any set A and B: $A = (A \cap B) \cup (A - B)$

14. If $tan\frac{\theta}{2} = \sqrt{\frac{1-c}{1+c}}\tan\frac{\varphi}{2}$ *prove that* $\cos\varphi = \frac{\cos\theta - c}{1 - c\cos\theta}$

15. Find the general solution for the following equation:

$$\cos x + \cos 3x - 2\cos 2x = 0$$

OR

In any triangle ABC, show that:

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

16. Solve the following inequation and represent it on the number line:

$$2x - \frac{4}{5} \le x - 3 < 3x + 6$$

17. The letters of the word ‘DIGITAL’ are written in all possible orders and these words are written out as in a dictionary. Find the rank of the word ‘DIGITAL’.

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

OR

Determine the 4th term from the end in the expansion of $\left(\frac{x^3}{2} - \frac{2}{x^2}\right)^9, x \neq 0.$

19. How many different words can be formed with the letters of the word PARALLEL so that

i)the vowels always come together?

ii)the vowels never come together?

OR

A committee of 6 is to be formed out of 6 gents and 4 ladies. How many ways can it be done, when

i) atleast three ladies are included?

ii) at most three ladies are included?

SECTION – C

20. Prepare the inequations and find the solution region for the following situations graphically: A company manufactures two types of stickers A: “SAVE ENVIRONMENT” and B: “BE COURTEOUS”. Type A requires 5 minutes each for cutting and 10 minutes each for assembling. Type B requires 8 minutes each for cutting and 8 minutes each for assembling. There are 3 hrs and 20 minutes available for cutting and 4 hours available for assembling in a day. Give your views about “SAVE ENVIRONMENT”.

21. 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. How many watch all the three games? How many watch exactly one of the three games?

22. Prove that: $\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\frac{5\pi}{8}\right)\left(1+\cos\frac{7\pi}{8}\right)=\frac{1}{8}$.

23. Prove that : $\sin 10^0 \sin 30^0 \sin 50^0 \sin 70^0 = \frac{1}{16}$

OR

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

24. Let S be the sum, P the product and R the sum of reciprocals of n terms in a GP. Prove that $P^2R^n=S^n$

25. Find the sum of first n terms of the series: 3 + 7 + 13 + 21 + 31+ …

26. 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.

OR

If the coefficient of a^{r-1}, a^r and a^{r+1} in the expansion of $(1+ a)^n$ are in arithmetic progression, prove that $n^2 - n(4r+1) + 4r^2 - 2 = 0$.

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