INDIANSCHOOL SOHAR
PRE FINAL EXAM – 2015-16
MATHEMATICS

STD: XI   **MARKS: 100**
DATE: 04 .02.16   **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. Find the co-ordinates of the point P which is five-sixth of the way from A(-2,0,6) to B(10,-6,12).
2. Find the image of (-3,8,-7) in the xy- plane.

3. Write the converse of the following statement:

   If two lines are parallel, then they do not intersect in the same plane.

4. Write the negation of the following statement:

   x+ y = y + x

5. Find the modulus of $\frac{1+i}{1-i}$

6. Find the degree measure of the angle subtended at the centre of a circle of diameter 200 cm by an arc length 22cm.

SECTION – B

7. Solve: $\tan\theta + \tan2\theta + \sqrt{3}\tan\theta \tan2\theta = \sqrt{3}$
8. In any $\Delta ABC, prove\ that: a\cos\left(\frac{B-C}{2}\right) = (b+c)\sin\frac{A}{2}$
9. Prove the following by using the principle of mathematical induction for all n$\in N$:

   $10^n + 3(4)^{n+2} + 5$ is divisible by 9.

10. Show that for any sets A and B,
$(A \cup B) - (A \cap B) = (A - B) \cup (B - A)$

11. Find the domain and the range of the real function f defined by $f(x) = \frac{4}{1-x^2}$

12. If $x = 1 + a + a^2 + \ldots \infty, |a| < 1, y = 1 + b + b^2 + \cdots . \infty, |b| < 1$
; show that $1 + ab + a^2b^2 + \cdots = \frac{xy}{x+y-1}$

OR

Shamshad Ali buys a scooter for Rs 22000. He pays Rs 4000 cash and agrees to pay the balance in annual instalment of Rs 1000 plus 10% interest on the unpaid amount. How much will the scooter cost him?

13. If $a_1, a_2, \ldots a_n$ are in A.P where $a_i > 0$ for all i, show that
$$\frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + \ldots \ldots \ldots \ldots .. + \frac{1}{\sqrt{a_{n-1}} + \sqrt{a_n}} = \frac{n-1}{\sqrt{a_1} + \sqrt{a_n}}$$

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

OR

Convert the complex number $Z = \frac{i-1}{\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}}$ in the polar form

15. Find $\frac{dy}{dx}$ when $y = \frac{x^{-3}\sin 2x}{1-x}$

OR

Evaluate: $\lim_{x \to 0} \frac{cosec x - \cot x}{x}$

16. Find the equation of the line through the point (3,2) which makes an angle of 45^0 with the line $x - 2y = 3$.

17. Three groups of children contain 3 girls and one boy; 2 girls and 2 boys, one girl and 3 boys. One child is selected at random from each group. Find the chance that the three selected consist of 1 girl and 2 boys.

OR

Two dice are rolled. A is the event that the sum of the numbers shown on the two dice is 5. B is the event that at least one of the die shown up a 3. Are the two events A and B i) mutually exclusive ii) exhaustive? Find the probability of obtaining neither A nor B.

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

(i) Vowels are all together (ii) there are always 4 letters between P and S?

19. Eighteen guests have to be seated, half on each side of a long table. Four particular guests desire to sit on one particular side and three others on the other side. Determine the number of ways in which the seating arrangement can be made.

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20. In a survey of 100 students, the number of students studying the various languages were found to be , English only 18, English but not Hindi 23, English and Sanskrit 8, English 26, Sanskrit 48, Sanskrit and Hindi 8, no language 24. Find i) how many students were studying Hindi? ii) How many students were studying English and Hindi?

21. Solve the following system of inequalities graphically:

    $x \geq 0, y \geq 0, x + y \geq 4, \ x + 2y \leq 8, x - y \leq 0$

22. 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 $n^2 - n(4r+1) + 4r^2 - 2 = 0$.

    OR

    Prove that the coefficient of x ^{p} in the expansion of $\left(x^2 + \dfrac{1}{x}\right)^{2n}$ is $\dfrac{(2n)!}{\left(\frac{4n-p}{3}\right)!\left(\frac{2n+p}{3}\right)!}$

23. 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.

24. Find the length of perpendicular from origin to the line joining two points whose coordinates are $(\cos\theta, \sin\theta) \ and \ (\cos\varphi, \sin\varphi)$.

25. Prove that : $cos^4 \dfrac{\pi}{8} + cos^4 \dfrac{3\pi}{8} + cos^4 \dfrac{5\pi}{8} + cos^4 \dfrac{7\pi}{8} = \dfrac{3}{2}$

    OR

    Prove that: $sin^3 x + sin^3\left(\dfrac{2\pi}{3} + x\right) + sin^3\left(\dfrac{4\pi}{3} + x\right) = -\dfrac{3}{4}\sin 3x$

26. Calculate mean and variance for the following distribution.

Classes	0 – 30	30 – 60	60 – 90	90 – 120	120 – 150	150 – 180	180 - 210
Frequency	2	3	5	10	3	5	2

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