THE INDIAN SCHOOL, BAHRAIN

II TERM EXAMINATION, NOVEMBER 2009

STD: XI **MAX. MARKS: 100**

SUB: MATHEMATICS **TIME : 3 HOURS**

General Instructions:

- All questions are compulsory.
- The question paper consists of 29 questions divided into three sections A, B & C.
- Question numbers 1 to 10 are of 1 mark each. Question numbers 11 to 22 are of 4 marks each and Question numbers 23 to 29 are of 6 marks each.

SECTION A **[10 x 1]**

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. Find the angle in radian through which a pendulum of length 75 cm swings if its tip describes an arc of length 15 cm.

3. Find the coordinates of a point, (other than the vertex) on the parabola $y^2 = 18x$ whose ordinate is equal to three times its abscissa.

4. Express the following expression in the form a + ib: $\dfrac{2-\sqrt{-25}}{1+\sqrt{-36}}$.

5. Find the value of x for which the points (x, -1), (2, 1) and (4, 5) are collinear.

6. Find the number of terms in the expansion of $(1+ 2x + x^2)^{20}$.

7. The third term of a G.P. is 4. Find the product of its first five terms.

8. Reduce the equation 3x - 4y + 10 = 0 into slope - intercept form and find the slope and y - intercept.

9. If ***m*** parallel lines in a plane are intersected by ***n*** parallel lines, find the number of parallelograms formed.

10. Write the equation of the ellipse with vertices (± 5, 0) and foci (± 4, 0).

SECTION B [12 x 4]

11. Prove that $a + ar + ar^2 + ... + ar^{n-1} = \frac{a(1 - r^n)}{1-r}$, $r \neq 1$, $n \in N$ using the principle of mathematical induction.

12. Find the equation of a circle which has its centre at (2, 1) and touches the straight line $3x + 4y = 0$.

13. If $\frac{(a+i)^2}{2a-i} = p + iq$, show that $p^2 + q^2 = \frac{(a^2+1)^2}{4a^2+1}$.

14. The mid - points of the sides of a triangle ABC are given by (-2, 3, 5), (4, -1, 7) and (6, 5, 3). Find the coordinates of the vertices of the triangle.

15. i) Find r, if ${}^{10}P_r = 5040$.

    ii) How many numbers can be formed with the digits 1, 2, 3, 4, 3, 2, 1 so that the odd digits always occupy the odd places?

16. Find the sum of n terms of the series $1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \ldots$

17. Prove that $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$

18. Two lines passing through the point (2, 3) intersects each other at an angle of 60°. If the slope of one line is 2, find equation of the other line.

19. The sum of three numbers in G.P. is 56. If we subtract 1, 7, 21 from these numbers in that order, we obtain an arithmetic progression. Find the numbers.

20. Find the coordinates of the foci, the vertices, the eccentricity and the length of the latus rectum of the hyperbola $9y^2 - 4x^2 = 36$.

21. Find the equation of a straight line which passes through (3, 4) and the sum of whose intercepts on the coordinate axes is 14.

22. Solve the following system of inequalities graphically:

    $3x + 4y \leq 60$, $x + 3y < 30$, $x \geq 0$, $y \geq 0$.

SECTION C [7 x 6]

23. If $\tan(x + y) = n \tan(x - y)$ show that $(n + 1) \sin 2y = (n - 1) \sin 2x$

or

Prove that $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$

24. The sum of two numbers is 6 times their geometric mean. Show that the numbers are in the ratio $3 + 2\sqrt{2} : 3 - 2\sqrt{2}$

25. Find the image of the point (3, 8) with respect to the line $x + 3y = 7$ assuming the line to be a plane mirror.

26. If the coefficients of x, x^2 and x^3 in the binomial expansion of $(1 + x)^{2n}$ are in A.P. prove that $2n^2 - 9n + 7 = 0$.

27. Derive the standard equation of an ellipse with centre at the origin and foci on the x- axis.

or

The cable of a uniformly loaded suspension bridge hangs in the form of a parabola. The roadway which is horizontal and 100 m long is supported by vertical wires attached to the cable, the longest wire being 30 m and the shortest being 6 m. Find the length of a supporting wire attached to the roadway 18 m from the middle.

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

29. If the lines $y = 3x + 1$ and $2y = x + 3$ are equally inclined to the line $y = mx + 4$, find the value of m.