THE INDIAN SCHOOL, KINGDOM OF BAHRAIN

I TERM EXAMINATION, MAY 2010

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

1. Represent the set $G = \left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}\right\}$ in set – builder form.

2. If A = { 1 }, how many elements P[P{P(A)}] contains?

3. Find the ratio in which the line segment joining the points (2, 4, -3) and (-3, 5, 4) is divided by the xy - plane.

4. If U = { x : x $\leq$ 10, x ϵ N}, A = { x : x is a prime, x ϵ N}and B = { x : x is even, x ϵ N } then write $A \cap B'$ in Roster form.

5. The centroid of a triangle with vertices (- 2, 1, 3), (-2, a, -5) and (4, 7, b) is origin. Find value of a and b.

6. If P and Q are two sets such that $P \subset Q$, then find $P \cup Q$

7. For any three sets A, B and C, is it true that $A \cap B = A \cap C$ implies B = C ?

8. Find the value of k for which the line $(k – 3)x – (4 – k^2)y + k^2 – 7k + 6 = 0$ is parallel to the y – axis.

9. If X and Y are two sets such that n(X) = 17, n(Y) = 23 and $n(X \cup Y) = 38$ find $n(X \cap Y)$.

10. Find the distance between the parallel lines 3x – 4y + 7 = 0 and 3x – 4y + 5 = 0.

SECTION B

11. If U = { 1, 2, 3, 4, 5, 6, 7, 8, 9 }; A = { 2, 4, 6, 8 }; B = { 1, 2, 5, 8 } and C = { 2, 3, 4, 5 } then verify that:

i) $(A \cup B)' = A' \cap B'$ ii) $A - (B \cap C) = (A - B) \cup (A - C)$

12. The vertices of a triangle are A (0, 7, 10), B(- 1, 6, 6) and C (-4, 9, 6). Show that ABC is an isosceles right angled triangle.

13. By using Principle of Mathematical Induction prove the following for all n ϵ N :

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

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

ii) Find a point on the x – axis, which is equidistant from the points (7, 6) and (3, 4).

15. Find the equation of the line passing through the point (2, 2) and cutting off intercepts on the axes whose sum is 9.

OR

Find the equation of a line drawn perpendicular to the line $\frac{x}{4}+\frac{y}{6}=1$ through the point where it meets the y – axis.

16. In an examination 80 % students passed in Mathematics, 72 % passed in Science and 13 % failed in both the subjects. If 312 students passed in both the subjects, find the total number of students who appeared in the examination.

17. Find the angle between the lines $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$.

18. Find the distance of the point (2, 3) from the line 2 x – 3 y + 9 = 0 measured along a line x – y + 1 = 0.

19. Find the coordinates of the points which trisect the line segment joining the points P(4, 2, -6) and Q (10, -16, 6).

20. In triangle ABC with vertices A (1, 2), B(4, 5) and C(0, -3) Find the equation of the perpendicular from A to BC.

OR

Find the equation of the lines through the point (3, 2) which makes an angle of 45° with the line x – 2y = 3.

21. By using Principle of Mathematical Induction prove the following for all n є N:

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

22. By using Principle of Mathematical Induction prove the following for all n є N :

$$\frac{1}{1.4}+\frac{1}{4.7}+\frac{1}{7.10}+........................+\frac{1}{(3n-2)(3n+1)}=\frac{3}{3n+1}$$

SECTION C

23. R is a point (1, 3, 4) and S is the point (1, - 2, - 1). A point P moves so that 3PR = 2PS. Find the locus of P.

24. Prove by the principle of mathematical induction that $2(7^n) + 3(5^n) - 5$ is divisible by 24.

25. 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?

26. Prove by the principle of mathematical induction that

$$1.3+3.5+5.7+...+(2n-1)(2n+1)=\frac{n(4n^2+6n-1)}{3}$$ for all n є N

27. Find the coordinates of the foot of the perpendicular from the point (-1,3) to the line 3x – 4y – 16=0.

28. If p and q are the lengths of perpendiculars from the origin to the lines $x\cos\theta - y\sin\theta = k\cos 2\theta$ and $x\sec\theta + y\operatorname{cosec}\theta = k$ respectively, prove that $p^2 + 4q^2 = k^2$.

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