

**THE INDIAN SCHOOL**  
**KINGDOM OF BAHRAIN**  
**ANNUAL EXAMINATION – FEBRUARY 2010**

**STD: XI**  
**SUBJECT: MATHEMATICS**

**MAX.MARKS: 100**  
**TIME: 3HOURS**

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**General Instructions**

1. All questions are compulsory
  2. The question paper consists of **29** questions divided in to three sections A, B and C.
  3. 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.
  4. All the questions in section **A** are to be answered in one word, one sentence or as per the exact requirement of the question.
  5. This question paper contains 3 printed pages
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**SECTION A**

1. Find the value of  $\tan 75^\circ$
2. If  $A = \{1,2,3,4,5,6\}$  and  $B = \{3,4,5,6,7,8\}$ , find  $A - B$
3. Find the domain of  $f(x) = \sqrt{4 - x^2}$
4. Find the modulus of the complex number  $\frac{1}{2 + 2i}$
5. Find the middle term in the expansion of  $\left(3 - \frac{x^3}{6}\right)^8$
6. Which term of the sequence  $\sqrt{3}, 3, 3\sqrt{3}, \dots$  is 729
7. Reduce the line  $\sqrt{3}x - y + 8 = 0$  in the normal form
8. Evaluate  $\lim_{x \rightarrow 0} \frac{\sin 5x}{\sin 4x}$
9. Differentiate  $\frac{x-1}{x+1}$  with respect to  $x$
10. If  $P(A) = \frac{1}{4}$  and  $P(B) = \frac{1}{2}$  and if  $A$  and  $B$  are mutually exclusive find  $P(A \cup B)$

**SECTION B**

11. If  $U = \{1,2,3,4,5,6,7,8,9\}$   $A = \{2,4,6,8\}$  and  $B = \{1,2,5,7\}$  Verify that  
1)  $(A \cup B)' = A' \cap B'$       2)  $(A \cap B)' = A' \cup B'$

12. In a survey of 30 students, it was found that 15 had taken Mathematics, 12 had taken Physics and 11 had taken Chemistry, 5 had taken Mathematics and Chemistry, 9 had taken Mathematics and Physics and 4 had taken Physics and Chemistry and 2 had taken all the three subjects. Find the number of students that had taken

a) Only Chemistry

b) Only one of the subject

13. If  $A = \{a, b, c\}$ ;  $B = \{a, b\}$  and  $C = \{b, d\}$   
Verify that  $A \times (B \cup C) = (A \times B) \cup (A \times C)$

14. Prove that  $\frac{\sin 3x + \sin 5x + \sin 7x + \sin 9x}{\cos 3x + \cos 5x + \cos 7x + \cos 9x} = \tan 6x$

**Or**

Prove that  $\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$

15. Find the general solution of  $\cos 3x + \cos x - \cos 2x = 0$

16. Prove using PMI that

$$\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \dots + \frac{1}{(3n-2)(3n+1)} = \frac{n}{3n+1} \quad \text{For } n \in N$$

17. If the  $p^{\text{th}}$ ,  $q^{\text{th}}$ ,  $r^{\text{th}}$  terms of a G.P are respectively a, b, c respectively, Prove that  $a^{q-r} \cdot b^{r-p} \cdot c^{p-q} = 1$

**Or**

Find the sum to n terms of the series  $1 \times 2 \times 3 + 2 \times 3 \times 4 + 3 \times 4 \times 5 + \dots$

18. If 'a' and 'b' are the lengths of the 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  $a^2 + 4b^2 = k^2$

19. Find the coordinate of the foci, vertices, length of the latus rectum and eccentricity of the ellipse  $36x^2 + 4y^2 = 144$

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

21. Evaluate  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{1 - \sin x}{(\pi - 2x)^2}$

**Or**

Find the derivative of  $\frac{x+2}{x+3}$  from first principle

22. Prove that  $\sqrt{3}$  is irrational by contradiction method

**Or**

Check the validity of the statement “If  $x$  is a real number such that  $x^3 + 4x = 0$ , then  $x = 0$ ” is true by

a) Direct method

b) method of contra positive

### SECTION C

23. If  $\tan x = \frac{3}{4}$  and  $\pi < x < \frac{3\pi}{2}$  find the values of  $\sin \frac{x}{2}$ ,  $\cos \frac{x}{2}$ ,  $\tan \frac{x}{2}$

**Or**

Prove that  $\frac{\sin A \cdot \sin 2A + \sin 3A \cdot \sin 6A}{\sin A \cdot \cos 2A + \sin 3A \cdot \cos 6A} = \tan 5A$

24. If  $(x + iy)^{\frac{1}{3}} = u + iv$ , then Prove that  $\frac{x}{u} + \frac{y}{v} = 4(u^2 - v^2)$

25. Solve the following system of linear in equations graphically:

$$3x + 2y \leq 24; \quad x + 2y \leq 16; \quad x + y \leq 10, \quad x \geq 0; \quad y \geq 0$$

26. A group consists of 5 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has

a) At most 2 girls

b) at least one boy and one girl

c) at least 2 girls

27. The Coefficients of  $a^{r-1}$ ,  $a^r$ ,  $a^{r+1}$  in the expansion of  $(1+a)^n$  are in arithmetic progression. Prove that  $n^2 - n(4r+1) + 4r^2 - 2 = 0$

**Or**

The coefficients of the  $(r-1)^{\text{th}}$ ,  $r^{\text{th}}$ ,  $(r+1)^{\text{th}}$  terms in the expansion of  $(x+1)^n$  are in the ratio 1:3:5. Find  $n$  and  $r$

28. Find the mean and variance of the following frequency distribution

| Marks Obtained | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 |
|----------------|------|-------|-------|-------|-------|
| No of students | 2    | 3     | 8     | 5     | 2     |

29. In a class of 50 students 30 opted for Biology and 18 opted for Biotechnology. 6 students opted for both Biology and Biotechnology. If one student is selected at random, find the probability that

a) The student opted for Biology or Biotechnology

b) The student has opted neither Biology nor Biotechnology

c) The Student has opted Biotechnology but not Biology