

THE INDIAN SCHOOL, KINGDOM OF BAHRAIN
ANNUAL EXAMINATION: 2010 – 2011

STD: XI
SUB: MATHEMATICS

MAX. MARKS: 100
TIME: 3 HOURS

General Instructions:

1. All questions are compulsory.
2. The question paper consists of 29 questions divided into 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.

SECTION A

1. Find the number of elements in the power set of A, if $A = \{3, 8, 9, 11\}$.
2. Write the contrapositive and converse of the following statement: "If a triangle is equilateral, then it is isosceles."
3. Find the truth value of the following compound statement: " $4 + 2 = 6$ or $9 + 7 = 15$."
4. What is the range of signum function?
5. Solve: $x^2 - x + 2 = 0$
6. Find the positive integer n so that $\lim_{x \rightarrow 3} \frac{x^n - 3^n}{x - 3} = 108$.
7. Evaluate: $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$ $a, b \neq 0$.
8. Name the octant in which the point $(-4, 2, -5)$ lies.
9. Find the distance of the point $(-1, 1)$ from the line $12(x + 6) = 5(y - 2)$.
10. Find the middle term in the expansion of $\left[3x - \frac{x^3}{3}\right]^6$

SECTION B

11. In a survey of 500 persons it was found that 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.
 - i) How many watch all the three games?
 - ii) How many watch exactly one of the three games?
 - iii) How many watch at least one of these games?
12. If $A = \{2, 5\}$, $B = \{3, 5\}$ $C = \{1, 2, 3\}$ then verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.
13. i) Let $f = \{(1, 1), (2, 3), (0, -1), (-1, -3)\}$ be a function from Z to Z defined by $f(x) = ax + b$, for some integers a, b. Determine a, b.
 - ii) Find the domain and range of the real function $f(x) = -|x + 1|$
14. Prove that $\cos^2 x + \cos^2\left(x + \frac{2\pi}{3}\right) + \cos^2\left(x - \frac{2\pi}{3}\right) = \frac{3}{2}$

OR

Solve $\sin 2x - \sin 4x + \sin 6x = 0$

15. Prove the following by the principle of mathematical induction for all $n \in \mathbb{N}$.

$$\frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \frac{1}{7 \cdot 9} + \dots + \frac{1}{(2n+1)(2n+3)} = \frac{n}{3(2n+3)}$$

16. 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) $A - (B \cap C) = (A - B) \cup (A - C)$

17. The sum of first three terms of a GP is 3.9 and their product is 1. Find the common ratio and terms.

OR If the sum of first p, q and r terms of an A.P. are a, b and c respectively, prove that

$$\frac{a}{p}(q-r) + \frac{b}{q}(r-p) + \frac{c}{r}(p-q) = 0$$

18. Find the equation of the hyperbola whose foci are $(0, \pm\sqrt{10})$ and passing through the point $(2, 3)$.

19. Find the sum to n terms of the series: $3 + 7 + 13 + 21 + 31 + \dots$

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

20. In the triangle ABC whose vertices are $A(2, 4)$, $B(-3, 4)$ and $C(-5, -3)$, find the equation of the altitude from the vertex B. Also find the coordinates of the foot of the altitude from B.

21. If $y = \sqrt{\frac{1 + \sin x}{1 - \sin x}}$, then prove that $\cos x \frac{dy}{dx} - y = 0$

OR Find the derivative of $x \sin x$ from the First Principle.

22. Find the coordinates of the points which trisect the line segment joining the points $A(3, 1, -2)$ and $B(12, -14, 8)$.

SECTION C

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

OR

Prove that $\frac{\sin x \sin 2x + \sin 2x \sin 5x + \sin 3x \sin 10x}{\sin x \cos 2x + \sin 3x \cos 6x + \sin 2x \cos 11x} = \tan 7x$

24. Two students A and B appeared in IIT examination. The probability that A will qualify the examination is 0.05 and that B will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that

- i) both A and B will not qualify the examination
- ii) at least one of them will not qualify the examination
- iii) only one of them will qualify the examination.

25. Find the coefficient of x^6 in the product $(1+2x)^6(1-x)^7$ using binomial theorem.

26. Solve the following system of inequalities graphically

$$x + 2y \leq 10, \quad x + y \geq 1, \quad x - y \leq 0, \quad x \geq 0, \quad y \geq 0$$

27. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has

- a. exactly three girls?
- b. at least 3 girls?
- c. at most 2 girls?

OR

- i) Find how many arrangements can be made with the letters of the word **FOOTBALL**?
- ii) How many of them will have all the vowels together?
- iii) How many of them have 3 letters between F and B?

28. If $Z_1 = 1 + i^{14}$ and $Z_2 = 1 - i^7$

- i) Express $\frac{Z_1}{Z_2}$ in modulus amplitude form.
- ii) Find $\left| \frac{Z_1 + Z_2 + 1}{Z_1 - Z_2 + 1} \right|$

29. Calculate the arithmetic mean, variance and standard deviation (correct to 2 decimal places).

Classes	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Frequency	3	7	12	15	8	3	2