# THE INDIAN SCHOOL
## KINGDOM OF BAHRAIN
## FIRST TERMINAL EXAMINATION-2012

**STD: XII** **MAX.MARKS: 100**
**SUBJECT: MATHEMATICS** **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 4 printed pages

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1. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ then $A + A' = I$, find the value of $\alpha$
2. For the determinant $\begin{vmatrix} 3 & -4 \\ -1 & 4 \end{vmatrix}$ find $M_{12}$ and $A_{21}$.
3. If A is square matrix such that $A^2 = A$ then find the value of $(I + A)^3 - 7A$
4. Find the order of the non singular matrix A if $|A| = 2$ and $|adjA| = 8$
5. Find k if the points (k , 0), (4 , 0), (0 , 2) are collinear
6. Find the direction cosines of a vector joining the points A(1,2,-3) and B(-1,2,-1) directed from A to B
7. If $\vec{a} = \hat{\imath} + 2\hat{\jmath} - 3\hat{k}$ and $\vec{b} = 2\hat{\imath} + 4\hat{\jmath} + 9\hat{k}$. Find a unit vector parallel to $\vec{a} + \vec{b}$
8. Find the distance between the point (2,-1,5) and the plane x + 2y - 2z = 4
9. Find a if $(2\hat{i} + 6\hat{j} + 27\hat{k}) \times (\hat{i} + 3\hat{j} + a\hat{k}) = \vec{0}$
10. Find the intercept made by the plane 2x – 3y + 4z - 3 = 0 with the Z axis

## SECTION B

11. Express the matrix $\begin{bmatrix} 2 & 5 & 6 \\ 3 & -3 & 2 \\ -3 & 6 & -1 \end{bmatrix}$ as a sum of a symmetric and skew symmetric matrix

12. Find the matrix X such that $X\begin{bmatrix}1 & 2 & 3\\ 4 & 5 & 6\end{bmatrix}=\begin{bmatrix}-7 & -8 & -9\\ 2 & 4 & 6\end{bmatrix}$

**OR**

If $A=\begin{bmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix}$ Prove that $A^n=\begin{bmatrix}\cos n\theta & \sin n\theta\\ -\sin n\theta & \cos n\theta\end{bmatrix}$

13. Prove using properties of determinants that $\begin{vmatrix}a-b-c & 2a & 2a\\ 2b & b-c-a & 2b\\ 2c & 2c & c-a-b\end{vmatrix}=(a+b+c)^3$

14. Prove using properties of determinants that $\begin{vmatrix}a^2+2a & 2a+1 & 1\\ 2a+1 & a+2 & 1\\ 3 & 3 & 1\end{vmatrix}=(a-1)^3$

OR

$$\begin{vmatrix}\alpha & \beta & \gamma\\ \alpha^2 & \beta^2 & \gamma^2\\ \beta+\gamma & \gamma+\alpha & \alpha+\beta\end{vmatrix}=(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)(\alpha+\beta+\gamma)$$

15. If $x\neq y\neq z$ *and* $\begin{vmatrix}x & x^2 & 1+x^3\\ y & y^2 & 1+y^3\\ z & z^2 & 1+z^3\end{vmatrix}=0$ *then prove that* $xyz=-1$

16. Express the vector $\vec{a}=5\vec{i}-2\vec{j}+5\vec{k}$ as the sum of two vectors such that one is parallel to the vector $\vec{b}=3\vec{i}+\vec{k}$ and other is perpendicular to $\vec{b}$.

OR

If $\vec{a},\vec{b}$ *and* $\vec{c}$ are the position vectors of the vertices A, B, C of a triangle ABC, prove that its area is $\frac{1}{2}\left|\vec{a}X\vec{b}+\vec{b}X\vec{c}+\vec{c}X\vec{a}\right|$

17. If $\vec{a}=\hat{i}+2\hat{j}-3\hat{k}$ *and* $\vec{b}=3\hat{i}-\hat{j}+2\hat{k}$ Find a unit vector perpendicular to $\vec{a}+b$ and $\vec{a}-\vec{b}$

18. Prove that $\left[\vec{a}+\vec{b}\quad \vec{b}+\vec{c}\quad \vec{c}+\vec{a}\right]=2\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

19. Find the point of intersection between the lines $\frac{x+1}{3}=\frac{y+3}{5}=\frac{z+5}{7}$ and $\frac{x-2}{1}=\frac{y-4}{3}=\frac{z-6}{5}$ if they intersect

20. Find the shortest distance between lines whose equations are $\frac{x-2}{2}=\frac{y-6}{3}=\frac{z-3}{4}$ and $x=\frac{y-2}{2}=\frac{z+3}{3}$

OR

Find $\lambda$ so that the lines $\frac{3x-4}{6\lambda}=\frac{1-7y}{3}=\frac{2z-3}{3}$ *and* $\frac{5x-10}{2}=\frac{3-4y}{2\lambda}=\frac{z-1}{2}$ are perpendicular

21. If A and B are two independent events, then prove that $A'$ *and* $B'$ are also independent

22. Assume that each born child is equally likely to be a girl or a boy. If a family has two children, what is the conditional probability that both are girls given that

a) Youngest is a girl

b) At least one is a girl

**SECTION C**

23. Using Matrices, solve the following equation

$x + 2y - 3z = -4$, $2x + 3y + 2z = 2$ $3x - 3y + 4z = 11$

24. If $A=\begin{bmatrix} 0 & -\tan\frac{\alpha}{2} \\ \tan\frac{\alpha}{2} & 0 \end{bmatrix}$ Prove that $I + A = (I - A)\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ where I is a unit matrix of order 2

Use elementary transformation to find the inverse of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 7 \\ -2 & -4 & -5 \end{bmatrix}$

25. Show that the lines $\frac{x+3}{-3}=\frac{y-1}{1}=\frac{z-5}{5}; \frac{x+1}{-1}=\frac{y-2}{2}=\frac{z-5}{5}$ are coplanar. Also find the equation of the plane containing them.

26. Find the distance between the point P(6,5,9) and the plane determined by the points (3,-1,2),(5,2,4) and (-1,-1,6)

OR

Find the image of the point (1, 3, 4) in the plane $2x - y + z = -3$

27. Find the equation of a line through the point (-1,2,3) which is perpendicular to the lines $\frac{x}{2} = \frac{y-1}{-3} = \frac{z+2}{-2}$ and $\frac{x+3}{-3} = \frac{2y+2}{2} = \frac{z-1}{3}$
28. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter, car and a truck are 0.01, 0.03 and 0.15 respectively. One of the insured people meets with an accident. What is the probability that he is a car driver?
29. Three persons A, B and C attempt to solve a problem independently with their respective probabilities of solving the problem as 1/3 , 1/5 and 1/6 respectively. Find the probability that
    a) the problem is solved
    b) exactly one solves it
    c) exactly two solve it