12. Find the area of the parallelogram whose adjacent sides are determined by the vectors $\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$

13. . Find the shortest distance between the lines whose equations are

$$\frac{x+3}{-4} = \frac{y-6}{3} = \frac{z}{2} \quad \text{and} \quad \frac{x+2}{-4} = \frac{y}{1} = \frac{z-7}{1}$$

14. In 4 throws with a pair of dice, what is the probability of throwing doublets at least twice?

15. Show that the relation R on the set Z of integers given by R= $\{(a,b): 3 \text{ divides } a-b\}$ is an equivalence relation.

OR

If $f(x) = \frac{4x+3}{6x-4}$, $x \neq \frac{2}{3}$ .show that $f \circ f(x) = x$. What is the inverse of f .

16 Prove that $2\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{7} = \tan^{-1}\frac{31}{17}$.

OR

Solve $\tan^{-1}\left(\frac{1-x}{1+x}\right) = \frac{1}{2}\tan^{-1} x$, $x > 0$

17 Find the value of k so that the function f is continuous at the point $x = \frac{\pi}{2}$

$$f(x) = \begin{cases} \frac{k\cos x}{\pi - 2x} & \text{if } x \neq \frac{\pi}{2} \\ 3 & \text{if } x = \frac{\pi}{2} \end{cases}$$

18 If $x\sqrt{1+y} + y\sqrt{1+x} = 0$ for , $-1 < x < 1$ .Prove that $\frac{dy}{dx} = \frac{-1}{(1+x)^2}$

19 Find the equations of the normals to the curve $3x^2 - y^2 = 8$,parallel to the line x + 3y = 4.

20. Using differentials find the approximate value of $\sqrt{0.037}$

OR

If $f(x) = 3x^2 + 15x + 5$ then find the approximate value of f (3.02), using differentials

21. Find the intervals on which the function $f(x) = 2x^3 - 15x^2 + 36x + 6$ is (a) increasing (b) decreasing.

OR

Separate the interval $\left[0, \frac{\pi}{2}\right]$ into subintervals in which $f(x) = \sin^4 x + \cos^4 x$ is

(a) Increasing (b) decreasing.

22 Verify Lagrange's mean value theorem for the function $f(x) = (x-1)(x-2)(x-3)$ in $[0,4]$.

SECTION C (7 X 6 = 42 Marks)

23 Using matrices solve the following system of equations
$x - y + z = 4$, $x - 2y - 2z = 9$ and $2x + y + 3z = 1$

24 Find the image of the point P (1 , 3 ,4) in the plane $2x - y + z + 3 = 0$.

OR

Find the distance of the point (2, 3, 4) from the plane $3x+2y+2z+5=0$ measured parallel to the line $\frac{x+3}{3} = \frac{y-2}{6} = \frac{z}{2}$.

25 Bag I contains 3 red and 4 black balls and bag II contains 4 red and 5 black balls. One ball is transferred from bag I to bag II and then a ball is drawn from bag II.The ball so drawn is found to be red in colour.Find the probability that the transferred ball is black.

26 If $x^y + y^x = a^b$, then find $\frac{dy}{dx}$.

OR

If $(x-a)^2 + (y-b)^2 = c^2$, *for some* $c > 0$. Prove that $\frac{\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$ is a constant independent of a and b.

27 Show that the semi vertical angle of a right circular cone of given surface area and maximum volume is $\sin^{-1}\left(\frac{1}{3}\right)$.

28 Prove that the curves $x = y^2$ *and* $xy = k$ cut at right angles if $8k^2 = 1$

29 A diet for a sick person must contain at least 4000 units of vitamins,50 units of minerals and 1400 units of calories, Two foods X and Y are available at a cost of Rs 4 and Rs 3 per unit respectively. One unit of the food X contains 200 units of vitamins, 1 unit of minerals and 40 units of calories. Whereas one unit of food Y contains100 units of vitamins, 2 units of minerals and 40 units of calories. Find what combination of X and Y should be used to have least cost, satisfying the requirements. Solve it graphically.

THE INDIAN SCHOOL, KINGDOM OF BAHRAIN

SECOND TERMINAL EXAMINATION -2013

CLASS- XII | MAX.MARKS: 100

SUBJECT-MATHEMATICS | TIME: 3 Hrs

General Instructions

1. All questions are compulsory. This paper contains 3 printed pages
2. The question paper consists of **29** questions divided into three sections **A, B, 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 (10 X 1 = 10 Marks)

1. If $A = \begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix}$ .Find A^4.

2. If A is a square matrix of order 3 such that $|adjA| = 64$,find $|A|$

3. Find the value of the determinant $\begin{vmatrix} \cos 15 & \sin 15 \\ \sin 75 & \cos 75 \end{vmatrix}$.

4. If $|\vec{a}| = 2 \, and \, |\vec{b}| = 5$ and $|\vec{a} \times \vec{b}| = 8$ then find $\vec{a}.\vec{b}$.

5. If $f(x) = x^2 + 1$ and $g(x) = \frac{1}{x-1}$ then find $g \circ f(5)$.

6. Find the angle between the line $\frac{x-2}{3} = \frac{y+1}{-1} = \frac{z-3}{2}$ and the plane 3x+4y+z +5 = 0 .

7. Find the direction cosines of the line segment joining the points (0, 0, 0) and (3,-1, 5).

8. Find the value of $\tan^{-1}(\sqrt{3}) - \sec^{-1}(-2)$.

9. Find $\frac{dy}{dx}$ if $y = \tan^{-1}\left[\frac{1+\tan x}{1-\tan x}\right]$. $x \in \left[\frac{-\pi}{4}, \frac{\pi}{4}\right]$

10. If the rate of change of volume of a sphere is equal to the rate of change of its radius, then find the radius of the sphere?.

SECTION B (12 X 4 = 48 Marks)

11 Prove that $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = 4a^2b^2c^2$