THE INDIAN SCHOOL, KINGDOM OF BAHRAIN

II TERMINAL EXAMINATION, NOVEMBER 2009

STD: XII **MAX. MARKS: 100**

SUB: MATHEMATICS **TIME : 3 HOURS**

General Instructions:

1. All questions are compulsory.
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

1) If f: R $\rightarrow$R defined by f(x) = $\frac{2x+3}{2}$ is an invertible function, find f^{-1}

2) Using principal values find $\cos^{-1}\left(\cos\frac{2\pi}{3}\right)+\sin^{-1}\left(\sin\frac{2\pi}{3}\right)$

3) If A is a non singular matrix of order 3 and $|adjA| = |A|^n$ then n = ...

4) If A is a square matrix of order 3 and $|A| = 4$ then $|3A|$ is .....

5) If $\vec{a} = 2\hat{i}+2\hat{j}+\hat{k}$ and $\vec{b} = 3\hat{i}+\hat{j}-5\hat{k}$, find a unit vector in the direction of $\vec{a}-\vec{b}$.

6) Cartesian equations of a line AB are $\frac{2x-1}{2} = \frac{4-y}{7} = \frac{z+1}{2}$, write the direction ratios of a line parallel to AB.

7) For the determinant $\begin{vmatrix} 3 & -4 \\ -1 & 4 \end{vmatrix}$ find the minor M_{12} and Co factor A_{21}

8) For what value of λ are the vectors $a = 2\hat{i}+\lambda\hat{j}+\hat{k}$ and $b = \hat{i}-2\hat{j}+3\hat{k}$ perpendicular to each other

9) Find the least value of 'a' such that $f(x) = x^2 + ax + 1$ is strictly increasing in (1, 2).

10) Find $\int \frac{\cos\sqrt{x}}{\sqrt{x}}dx$.

SECTION B

11) Is the binary operation defined on a set N given by $a * b = \frac{a+b}{2}$ for all a, b ∈ N, commutative and associative?

12) Using properties of determinants prove that $\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix} = 1 + a^2 + b^2 + c^2$

13) Solve for x $\tan^{-1}(x+1) + \tan^{-1}(x-1) = \tan^{-1}\frac{8}{31}$, if $x > 0$

14) If $y = x^{\cot x} + (\sin x)^x$ find $\frac{dy}{dx}$

(OR)

If $\cos y = x \cos(a+y)$, Prove that $\frac{dy}{dx} = \frac{\cos^2(a+y)}{\sin a}$

15) Test the continuity of $f(x) = \begin{cases} \frac{\cos x}{\frac{\pi}{2} - x}, & \text{if } x \neq \frac{\pi}{2} \\ 1, & \text{if } x = \frac{\pi}{2} \end{cases}$ at $x = \frac{\pi}{2}$

16) By using differentials find the approximate value of $\sqrt[3]{27.81}$

17) Find the equations of the tangents to the curve $y = x^3 + 2x + 6$ which are perpendicular to the line x+14y +4=0

18) Find the intervals in which the function $f(x) = \sin x + \cos x$, $0 \le x \le 2\pi$ is strictly increasing or strictly decreasing

19) Find $\int \frac{1}{1-\tan x} dx$

20) A die is thrown again and again until three sixes are obtained. Find the probability of obtaining the third six in the sixth throw of the die

(OR)

Two cards are dawn from a pack of 52 cards without replacement. Find the probability distribution and the mean of number of kings drawn.

21) Find the equation of a plane passing through the line of intersection of the planes $\vec{r}.(\hat{i}+2\hat{j}+3\hat{k})-4=0$ and $\vec{r}.(2\hat{i}+\hat{j}-\hat{k})+5=0$ and perpendicular to the plane $\vec{r}.(5\hat{i}+3\hat{j}-6\hat{k})+8=0$

22) If $\bar{a},\bar{b},\bar{c}$ are respectively the position vectors of the vertices A,B,C of triangle ABC, Prove that the area of the triangle is $\frac{1}{2}\left|\bar{a}\times\bar{b}+\bar{b}\times\bar{c}+\bar{c}\times\bar{a}\right|$

SECTION C

23) Using Matrices solve : $2x + y + z = 1$, $x - 2y - z = \frac{3}{2}$ and $3y - 5z = 9$

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

25). Find $\frac{d^2y}{dx^2}$ when $x = a(\theta + \sin\theta)$ *and* $y = a(1 - \cos\theta)$ (OR)

If $\sqrt{1-x^2}+\sqrt{1-y^2} = a(x-y)$ prove that $\frac{dy}{dx}=\sqrt{\frac{1-y^2}{1-x^2}}$

26) Prove that the volume of the largest cone that can be inscribed in a sphere of radius R is $\frac{8}{27}$ of the volume of the sphere .

27) Show that of all the rectangles inscribed in a given fixed circle , the square has the maximum area

(OR)

Find the point on the curve $y^2 = 4x$ which is nearest to the point (2, - 8)

28). Integrate with respect to x

a) $\frac{\sin x}{\sin(x+a)}$ b) cos2x cos4x cos 6x

29) An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter, driver 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?
