# Aimstutorial MODEL PAPER - 5 

## MATHS - 1A

## SECTION - A

I. Answer ALL the following Very Short Answer Questions:
[10 x $2=20$ ]

1. If $f: Q \rightarrow Q$ is defined by $f(x)=5 x+4$, find $f^{-1}$.
2. Find the domain of the real function $f(x)=\frac{1}{\sqrt{1-x^{2}}}$.
3. Find the trace of $\left[\begin{array}{ccc}1 & 3 & 5 \\ 2 & -1 & 5 \\ 2 & 0 & 1\end{array}\right]$.
4. If $\left[\begin{array}{ccc}0 & 2 & 1 \\ -2 & -0 & -2 \\ -1 & x & 0\end{array}\right]$ is a skew symmetric matrix then find the value of $x$.
5. If $\alpha, \beta$ and $\gamma$ be the angle made by the vector $3 \bar{i}-6 \bar{j}+2 \bar{k}$ with the positive directions of the coordinate axes, then find $\cos \alpha, \cos \beta$ and $\cos \gamma$.
6. Find the vector equation of the line passing through the points $2 \bar{i}+\bar{j}+3 \bar{k},-4 \bar{i}+3 \bar{j}-\bar{k}$.
7. If $\overline{\mathrm{a}}=\overline{\mathrm{i}}+2 \overline{\mathrm{j}}-3 \overline{\mathrm{k}} \overline{\mathrm{b}}=3 \overline{\mathrm{i}}-\overline{\mathrm{j}}+2 \overline{\mathrm{k}}$ then show that $\overline{\mathrm{a}}+\overline{\mathrm{b}}, \overline{\mathrm{a}}-\overline{\mathrm{b}}$ are perpendicular.
8. Prove that $\frac{\cos 9^{\circ}+\sin 9^{\circ}}{\cos 9^{\circ}-\sin 9^{\circ}}=\cot 36^{\circ}$.
9. Find the period of $f(x)=\cos \left(\frac{4 x+9}{5}\right)$ intorid.in
10. If $\sinh x=\frac{3}{4}$ then find $\cosh 2 x$ and $\sinh 2 x$.

## SECTION - B

II. Answer any FIVE of the following Short Answer Questions:
11. If $A=\left[\begin{array}{lll}3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1\end{array}\right]$ then show that $A^{-1}=A^{3}$.
12. If the points whose postion vecotrs are $3 \bar{i}-2 \bar{j}-\bar{k}, 2 \bar{i}+3 \bar{j}-4 \bar{k}, \bar{i}+\bar{j}+2 \bar{k}, 4 \bar{i}+5 \bar{j}+\lambda \bar{k}$ are coplanar, then show that $\lambda=\frac{146}{17}$.
13. Find the area of the triangle formed with the points $A(1,2,3), B(2,3,1), C(3,1,2)$.
14. Show that $\sin A=\frac{\sin 3 A}{1+2 \cos 2 A}$. Hence find the value of $\sin 15^{\circ}$.
15. Solve $\sin \theta+\sin 5 \theta-\sin 3 \theta, 0<\theta<\pi$.
16. Prove that $\operatorname{Tan}^{-1} \frac{1}{2}+\operatorname{Tan}^{-1} \frac{1}{5}+\operatorname{Tan}^{-1} \frac{1}{8}=\frac{\pi}{4}$.
17. If $\cot \frac{A}{2}: \cot \frac{B}{2}: \cot \frac{C}{2}=3: 5: 7$ then show that $a: b: c=6: 5: 4$.

## SECTION-C

III. Answer any FIVE of the following Long Answer Questions. :
18. If $f: A \rightarrow B, g: B \rightarrow C$ are two bijective funcitons then prove that $g o f: A \rightarrow C$ is also a bijective function.
19. Using the principle of finite Mathematical Induction prove that
1.2.3+2.3.4+3.4.5+.........upto $n$ terms $=\frac{n(n+1)(n+2)(n+3)}{4}, \forall n \in N$.
20. Show that $\left|\begin{array}{lll}1 & a^{2} & a^{3} \\ 1 & b^{2} & b^{3} \\ 1 & c^{2} & c^{3}\end{array}\right|=(a-b)(b-c)(c-a)(a b+b c+c a)$.
21. Solve the following equations $3 x+4 y+5 z=18,2 x-y+8 z=13$ and $5 x-2 y+7 z=20$ by GaussJordan method.
22. Prove that the smaller angle $\theta$ between any two diagronals of a cube is given by $\cos \theta=1 / 3$.
23. If $A, B, C$ are angles in a triangle, then prove that $\sin ^{2} A+\sin ^{2} B-\sin ^{2} C=2 \sin A \sin B \cos C$.
24. In $\triangle A B C$ prove that $\frac{r_{1}}{b c}+\frac{r_{2}}{c a}+\frac{r_{3}}{a b}=\frac{1}{r}-\frac{1}{2 R}$.

