Kites Junior College
PRE-FINAL-I Examination
MATHS-IA

Time : 3 Hrs **Max.Marks:75**

SECTION-A

I.Answer all the questions. $10\times 2 = 20$

1. If f:R→ $(0,\infty)$ defined by f(x) =5^x,then find f^{-1}(x).
2. Find the domain of the real valued function f(x) =$\frac{1}{\sqrt{x^2-a^2}}\,(a>0)$
3. If A=$\begin{bmatrix}1 & 2\\3 & 4\end{bmatrix}$, B =$\begin{bmatrix}3 & 8\\7 & 2\end{bmatrix}$ and 2X +A =B, then find X
4. For any square matrix A, show that AA$'$ is symmetric.
5. If $\bar{a}=2i+4j-5k, \bar{b}=i+j+k$ and $\bar{c}=j-2k$.Find the unit vector in the opposite direction of $\bar{a}+\bar{b}+\bar{c}$.
6. Find the vector equation of the line passing through the point 2i + 3j + k and parallel to the vector 4i – 2j + 3k.
7. If $\bar{a}=i+2j-3k$ and $\bar{b}=3i-j+2k$, then how that $\bar{a}$+$\bar{b}$ and $\bar{a}$ - $\bar{b}$ are perpendicular to each other.
8. Find the period of the function tan (x + 4x + 9x +…….+n^2x) (n any positive integer)
9. Prove that $\frac{\cos 9^0+\sin 9^0}{\cos 9^0-\sin 9^0}$ = $\cos 36^0$
10. Show that $\tan h^{-1}\left(\frac{1}{2}\right)=\frac{1}{2}log_e 3$

SECTION-B

II. Answer *Any Five* of the following. $5\times 4 = 20$

11. If I = $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$ and E = $\begin{bmatrix}0 & 1\\0 & 0\end{bmatrix}$,then show that $(aI+bE)^3$ = $a^3 I$ +$3a^2bE$ where I is unit matrix of order 2.
12. ABCDEF is regular hexagon with Cenre 'O'.Show that $\overline{AB}+\overline{AC}$+$\overline{AD}+\overline{AE}+\overline{AF}$ =3 $\overline{AD}$= 6 $\overline{AO}$
13. If $\bar{a}=2i+j-k, \bar{b}=-i+2j-4k$ and $\bar{c}=i+j-k$, then find $(\bar{a}\times\bar{b}).(\bar{b}\times\bar{c})$
14. Prove that $\left(1+\cos\frac{\pi}{10}\right)\left(1+\cos\frac{3\pi}{10}\right)\left(1+\cos\frac{7\pi}{10}\right)\left(1+\cos\frac{9\pi}{10}\right)=\frac{1}{16}$
15. Solve $\sqrt{2}\,(\sin x+\cos x)$=$\sqrt{3}$
16. Prove that $\tan^{-1}\left(\frac{1}{2}\right)$ +$\tan^{-1}\left(\frac{1}{5}\right)+\tan^{-1}\left(\frac{1}{8}\right)$ =$\frac{\pi}{4}$
17. In a ΔABC show that $\frac{b^2-c^2}{a^2}$ =$\frac{\sin(B-C)}{\sin(B+C)}$

SECTION-C

III.Answer *Any Five* of the following. $5\times 7 = 35$

18. If f: A→ B is a bijection ,then prove that fof^{-} = I_B and f^{-I} of =I_A
19. Using Mathematical Induction,prove that statement for all n∈ N
$\left(1+\frac{3}{1}\right)\left(1+\frac{5}{4}\right)\left(1+\frac{7}{9}\right)$..........$\left(1+\frac{2n+1}{n^2}\right)$= $(n+1)^2$
20. Without expanding the determinant show that $\begin{vmatrix}b+c & c+a & a+b\\c+a & a+b & b+c\\a+b & b+c & c+a\end{vmatrix}$ = 2 $\begin{vmatrix}a & b & c\\b & c & a\\c & a & b\end{vmatrix}$
21. Solve 3x + 4y + 5z = 18, 2x – y + 8z = 13 and 5x – 2y + 7z = 20 by using "matrix inversion method".
22. If $\bar{a},\bar{b},\bar{c}$ are three vectors, then prove that
(i) $(\bar{a}\times\bar{b})\times\bar{c}=(\bar{a}\,.\bar{c})\bar{b}-(\bar{b}\,.\bar{c})\bar{a}$
(ii)$\bar{a}\times(\bar{b}\times\bar{c})=(\bar{a}\,.\bar{c})\bar{b}-(\bar{a}\,.\bar{b})\bar{c}$
23. If A + B + C = π, then prove that $cos^2\frac{A}{2}+cos^2\frac{B}{2}+cos^2\frac{C}{2}=2\left(1+sin\frac{A}{2}sin\frac{B}{2}sin\frac{C}{2}\right)$
24. If a = 13, b = 14,c = 15, show that R = $\frac{65}{8}$, r = 4, $r_1=\frac{21}{2}$, $r_2=12$ and r_3 = 14.