MATHEMATICS PAPER IA.- MAY 2011.

ALGEBRA, VECTOR ALGEBRA AND TRIGONOMETRY.

TIME : 3hrs **Max. Marks.75**

Note: This question paper consists of three sections A, B and C.

SECTION A

VERY SHORT ANSWER TYPE QUESTIONS. **10X2 =20**

1. If $A=\left\{0,\frac{\pi}{6},\frac{\pi}{3},\frac{\pi}{4},\frac{\pi}{3},\frac{\pi}{2}\right\}$ and f:A $\rightarrow$ B is surjection defined by f(x)=cosx then find B
2. Find the domain of of the function f(x)=log(x^2-4x+3)
3 If a=2i+5j+k and b=4i+mj+nk are collinear vectors then find the value of m and n
4 .If a=i+2j-3k and b=3i-j+2k then S.T. (a+b) , (a-b) are mutually perpendicular
5 .Find vector equation of the plane passing through points (1,-2,5) (0,-5,-1) and (-3,5,0)
6 . If cosθ+ sinθ=√2 cosθ prove that cosθ- sinθ=√2 sinθ
7 .Find the value of cos42+cos78+cos162
8 .If coshx=5/2 then find i) cosh(2x) ii) sinh2x
9 .In ABC express $\sum r_1\cot(A/2)$ in terms of “s”
10. If Z_1= -1 Z_2=i then find the value of Arg (Z_{1}/ Z_{2})

SECTION B

SHORT ANSWER TYPE QUESTIONS. **5X4 =20**

Note : Answer any FIVE questions. Each question carries 4 marks.

11 . If ABCDEF is a regular hexagon with centre G, then prove that

AB + AC + AD+ AE + AF = 3AD = 6AG

12 .If a=i-2j-3k b=2i+j-k and c=i+3j-2k verify ax(bxc)≠(axb)xc
13 .If A+B=45 then S.T (1+TanA)(1+TanB)=2 hence deduce that

$$\tan\ 22\frac{1}{2}=\sqrt{2}-1$$

14 .Solve $3\tan^4\alpha-10\tan^2\alpha+3=0$

15 Prove that $\tan^{-1}\frac{1}{8}+\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{1}{5}=\frac{\pi}{4}$

16. If $a=(b+c)\cos\theta$ prove that $\sin\theta=\frac{2\sqrt{bc}}{b+c}\cos\frac{A}{2}$.

17 . prove that $\frac{\sin 6\theta}{\sin\theta} = 32\cos^5\theta - 35\cos^3\theta + 6\cos\theta$

SECTION C

LONG ANSWER TYPE QUESTIONS. **5X7 =35**

Note: Answer any Five of the following. Each question carries 7 marks.

18 . Let f: A→ B and g: B→C be bijection. Then $(gof)^{-1} = f^{-1}og^{-1}$

19 .Show that $\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + ...$ up to n terms $= \frac{n}{3n+1}$ for all n ∈ N

20 .Prove that by vector method the angle between two diagonals of a cube is $Cos^{-1}(1/3)$

21. In triangle ABC, prove that $\sin^2\frac{A}{2} + \sin^2\frac{B}{2} - \sin^2\frac{C}{2} = 1 - 2\cos\frac{A}{2}\cos\frac{B}{2}\sin\frac{C}{2}$

22 . If a=13, b=14, $c = 15$, prove that $R = \frac{65}{8}$, $r = 4$, $r_1 = \frac{21}{2}$, $r_2 = 12, r_3 = 14.$

23 . From the top of a tree on the bank of a lake, an Aeroplane in the sky makes an angle of elevation α and its image in the river makes an angle of depression β . if the height of the tree from the water surface is 'a' and that of the height of the aero plane is h, show that h=$\frac{a\sin(\alpha+\beta)}{\sin(\beta-\alpha)}$.

24 . Show that $(1+\cos\theta + i\sin\theta)^n + (1+\cos\theta - i\sin\theta)^n = 2^{n+1}\cos^n\left(\frac{\theta}{2}\right)\cos\left(\frac{n\theta}{2}\right)$.