MATHEMATICS PAPER IA.- MARCH 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**

Note : Attempt all questions. Each question carries 2 marks.

1. If $A=\left\{0,\frac{\pi}{6},\frac{\pi}{3},\frac{\pi}{4},\frac{\pi}{2}\right\}$ and f:A $\rightarrow$ B is surjection defined by f(x)=cosx then find B
2. If $f(x)=5^x$ then find $f^{-1}(x)$
3. If the position vectors of points A,B are -2i+j-k,-4i+2j+2k,and 6i-3j-13k respectively and AB=λ AC find λ
4. Find the vector equation line joining points 2i+j+3k and -4i+3j-k
5. If $4i+2\frac{p}{3}j+pk$ is parallel to the vector i+2j+3k find p
6. Prove that cos340cos40+sin200sin140= 1/2
7. Show that $\frac{\cos 9+\sin 9}{\cos 9-\sin 9}=\cot 36$
8. If coshx= 5/2 find the value of i) cosh(2x) ii) sinh2x
9. If a=26 cm b= 30 cm cosC=63/65 then find c
10. Write Z= -√7 +i√21 in polar form

SECTION B

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

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

11 .If a,b,c are non coplanar vectors then prove that the vectors 5a+6b+7c,7a-8b+9c and 3a+20b+5c are coplanar

12. Find the volume of the parallelepiped with coterminous edges 2i-3j,i+j-k,3i-k

13. Prove that $\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\frac{5\pi}{8}\right)\left(1+\cos\frac{7\pi}{8}\right)=\frac{1}{8}$

14. solve $1+\sin^2\theta=3\sin\theta\cos\theta$

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

16. If a,b,c are in A.P. then show that $\tan\frac{A}{2}\cos\frac{C}{2}=1$

17. Show that $16\sin^5\theta = \sin 5\theta - 5\sin 3\theta + 10\sin\theta$

SECTION C

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

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

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

19 .Prove By Mathematical Induction Show that

$a + ar + ar^2 \ldots\ldots\ldots\ldots = \frac{a(r^n-1)}{r-1}$

20 .Find the equation Plane passing from points A(2,3,-1),B(4,5,2) and C(3,6,5)

21 . Prove that $\sin\frac{A}{2}+\sin\frac{B}{2}+\sin\frac{C}{2}=1+4\sin\left(\frac{\pi-A}{4}\right)\sin\left(\frac{\pi-B}{4}\right)\sin\left(\frac{\pi-C}{4}\right)$

22 . If $a=(b-c)\sec\theta$ prove that $\tan\theta=\frac{2\sqrt{bc}}{b-c}\sin\frac{A}{2}$.

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 . If α,β are roots of the equation $x^2-2x+4=0$ then for any value n show that $\alpha^n+\beta^n=2^{n+1}\cos(\frac{n\pi}{3})$