MODEL QUESTION PAPER

MATHEMATICS PAPER I (A)

(Algebra, VecrorAlgebra and Trigonometry)
(English Version)

Time: 3 Hrs. Max. Marks. 75

Note : Question paper consists of 'Three' Sections A, B and C.

SECTION - A

I. Very short answer questions 10 x 2 = 20 Marks
(Attempt all questions)
(each question carries 'Two' marks)

01. Find the domain of the real valued functions $f(x) = \sqrt{9-x^2}$

02 In ΔABC, D is the mid point of BC. Express $\overline{AB} + \overline{AC}$ in terms of $\overline{AD}$

03. Find the vector equation of the line through the points $2\vec{i} + \vec{j} + 3\vec{k}$ and $-4\vec{i} + 3\vec{j} - \vec{k}$

04. If $\vec{a} = \vec{i} + 2\vec{j} + 3\vec{k}$ and $\vec{b} = 3\vec{i} - \vec{j} + 2\vec{k}$, then find the angle between $(2\vec{a} + \vec{b})$ and $(\vec{a} + 2\vec{b})$

05. Sketch the graph of sin x in $(0, 2\pi)$

06. Find the value of $\cos^2 45° - \sin^2 15°$

07. Show that $\cos h\,(3x) = 4 \cos h^3 X - 3 \cos hx$.

08. If $c^2=a^2+b^2$, write the value of 4 s(s-a) (s-b) (s-c) in terms of a and b.

09. Simplify $\dfrac{(\cos q - i\sin q)^7}{(\sin 2\theta - i\cos 2\theta)^4}$

10. Expand $\cos 4\theta$ in powers of $\cos\theta$

SECTION - B

II. Short answer questions. Attempt five questions 5 x 4 = 20 marks

11. $f : A \to B, g : B \to C$;
$f = \{(l, a), (2, c), (4, d), (3, d)\}$
and $g^{-1} = \{(2,a), (4, b), (1, c), (3, d)\}$
then compute $(gof)^{-1}$ and $f^{-1} og^{-1}$.

12. Find the cube root of $37-30\sqrt{3}$.

13. If $x = 1 + \log_a bc$, $y = 1 + \log_b ca$ and $z = 1 + \log_c ab$, then show that xyz = xy+yz+zx.

14. By vector method, prove that the diagonals of a parallelogram bisect each other.

15. Find the area:of the triangle formed with the points A(1, 2, 3), B (2, 3, 1) and C (3, 1, 2) by vector method.

16. Find the solution set of the equation $1 + \sin 2\theta = 3 \sin\theta \cos\theta$

17. Show that $\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{8}{17}\right) = \sin^{-1}\left(\frac{77}{85}\right)$

SECTION - C

III. Long answer questions : (Attempt '<u>FIVE</u>' questions) 5 x 7 = 35 marks

18. If $f : A \to B$ and $g : B \to C$ are bijections,
then prove that $gof : A \to C$ is also bijection.

19. Using the principle of Mathematical induction show that
$1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + ...$ upto n terms
$= \dfrac{n (n+1)^2 (n+2)}{12}$

20. For any vector $\vec{a}$, $\vec{b}$; and $\vec{c}$,

prove that $(\vec{a} \times \vec{b}) \times \vec{c} = (\vec{a} . \vec{c}) \vec{b} - (\vec{b} . \vec{c}) \vec{a}$

21. If A + B + C = 180°, then show that

sin 2A - sin 2B + sin2C = 4 cos A sin B cos C

22. In Δ ABC, show that

$$\frac{r_1}{bc} + \frac{r_2}{ca} + \frac{r_3}{ab} = \frac{1}{r} - \frac{1}{2R}$$

23. One end of the ladder is incontact 'with a wall and another end is in contact with the level ground making an angle 'α'. When the foot of the ladder is moved to a distance 'a' cms, the end in contact with the wall slides through 'b' cms. and the angle made by the ladder with the level ground is now 'β', show that

$$a = b \tan \left(\frac{\alpha + \beta}{2} \right)$$

24. Reduce the complex numbers 3 + 4 i,

$\frac{3}{4}$ (7+i) (1+i), $\frac{2(i-18)}{(1+i)^2}$, $\frac{5(i-3)}{1+i}$ to x+iy form. Show that the four points represented by these complex numbers form a square in the argand plane.