MS JUNIOR COLLEGE
Hyderabad
GUESS PAPER - 1
INTERMEDIATE 1ˢᵗ YEAR

Time: 3hours   **MATHEMATICS- IA**   Max.Marks:75

I. i) Very Short Answer Type Questions.   **(10 x 2 = 20)**

ii) Answer **ALL** questions.

iii) Each question carriers **TWO** marks.

1. If $f : R \to R$ define of $f(x) = \dfrac{2x+1}{3}$, then this function is injection or not? Justify.

2. Find the domain of the real valued function $f(x) = \dfrac{\sqrt{2+x} + \sqrt{2-x}}{x}$.

3. A certain bookshop has 10 dozen chemistry books, 8 dozen physics books, 10 dozen economics books. Their selling prices are Rs.80, Rs.60 and Rs.40 each respectively. Find the total amount the bookshop will receive by selling all the books using matrix algebra.

4. Find the rank of $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$ using elementary transformations.

5. Let $\overline{a} = 2\overline{i} + 4\overline{j} - 5\overline{k}$, $\overline{b} = \overline{i} + \overline{j} + \overline{k}$, $\overline{c} = \overline{j} + 2\overline{k}$. Find the unit vector in the opposite direction of $\overline{a} + \overline{b} + \overline{c}$.

6. Find the vector equation of the plane passing through the point (1, 2, 3) and parallel to the vectors (-2, 3, 1), (2, -3, 4).

7. If $\overline{a} = \overline{i} + 2\overline{j} - 3\overline{k}$ and $\overline{b} = 3\overline{i} - \overline{j} + 2\overline{k}$, then show that $\overline{a} + \overline{b}$ and $\overline{a} - \overline{b}$ are perpendicular to each other.

8. If $3\sin\theta + 4\cos\theta = 5$, then find the value of $4\sin\theta - 3\cos\theta$.

9. If $\dfrac{\sin\alpha}{a} = \dfrac{\cos\alpha}{b}$, then prove that $a\sin 2\alpha + b\cos 2\alpha = b$.

10. If $\sinh x = \dfrac{3}{4}$, find $\cosh 2x$ and $\sinh 2x$.

II. i) Short Answer Type Questions.   **(5 x 4 = 20)**

ii) Answer any **FIVE** questions.

iii) Each question carriers **FOUR** marks.

11. If $\theta - \phi = \pi/2$, then show that $\begin{bmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{bmatrix} \begin{bmatrix} \cos^2\phi & \cos\phi\sin\phi \\ \cos\phi\sin\phi & \sin^2\phi \end{bmatrix} = O$.

12. Show that the lines joining the pair of points 6a - 4b + 4c ; -4c and the line joining the pair of points - a - 2b - 3c; a + 2b - 5c intersect at the point -4c when a, b, c are non- coplanar vectors.

13. $\overline{a}$, $\overline{b}$, $\overline{c}$ are non zero vectors and $\overline{a}$ is perpendicular to both $\overline{b}$ and $\overline{c}$. If $|\overline{a}| = 2$, $|\overline{b}| = 3$, $|\overline{c}| = 4$ and $(\overline{b}, \overline{c}) = 2\pi/3$, then find $|[\overline{a}\ \overline{b}\ \overline{c}]|$.

14. Prove that $\left(1 + \cos\dfrac{\pi}{10}\right)\left(1 + \cos\dfrac{3\pi}{10}\right)\left(1 + \cos\dfrac{7\pi}{10}\right)\left(1 + \cos\dfrac{9\pi}{10}\right) = \dfrac{1}{16}$.

15. Solve : $1 + \sin^2\theta = 3\sin\theta\cos\theta$.

16. Find the value of $\tan\left[Sin^{-1}\dfrac{3}{5}+Cos^{-1}\dfrac{5}{\sqrt{34}}\right]$.

17. In $\triangle ABC$, show that $(b - c)^2 \cos^2 \dfrac{A}{2} + (b + c)^2 \sin^2 \dfrac{A}{2} = a^2$.

III. i) Long Answer Type Questions. **(5 x 7 = 35)**
   ii) Answer any **FIVE** questions.
   iii) Each question carriers **SEVEN** marks.

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

19. Prove that $2.3 + 3.4 + 4.5 + \dots\dots$ upto n terms $= \dfrac{n(n^2 + 6n + 11)}{3}$, by using Mathematical induction.

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 the linear equations by Matrix inverstion method $3x + 4y + 5z = 18$, $2x - y + 8z = 13$, $5x - 2y + 7z = 20$.

22. Find the equation of the plane passing through the points A(2, 3, -1), B(4, 5, 2) and C(3, 6, 5).

23. If A, B , C are angles of a triangle, then prove that $\cos^2 A + \cos^2 B - \cos^2 C = 1 - 2\sin A \sin B \cos C$.

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

* * * * * * * * *