

MS JUNIOR COLLEGE  
Hyderabad

GUESS PAPER - 2  
INTERMEDIATE 1<sup>st</sup> YEAR  
MATHEMATICS- IA

Time: 3 hours

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  $f(x) = \frac{\cos^2 x + \sin^4 x}{\sin^2 x + \cos^4 x} \forall x \in \mathbb{R}$  then show that  $f(2012) = 1$ .
2. Find domain and range of the function  $f(x) = \sqrt{9 - x^2}$ .
3. Construct a 3 x 2 matrix, whose elements are defined by  $a_{ij} = \frac{1}{2} |i - 3j|$ .
4. Solve the system of homogeneous equations  $x - y + z = 0$ ,  $x + 2y - z = 0$ ,  $2x + y + 3z = 0$ .
5. Find the angles made by the straight line passing through the points (1, -3, 2) and (3, -5, 1) with the coordinate axes.
6. If  $\vec{a}, \vec{b}, \vec{c}$  are the position vectors of the vertices A, B and C respectively of  $\triangle ABC$ , then find the vector equation of the median through the vertex A.
7. Find the unit vector perpendicular to the plane containing the vectors  $\vec{a} = 4\vec{i} + 3\vec{j} - \vec{k}$ ,  $\vec{b} = 2\vec{i} - 6\vec{j} - 3\vec{k}$ .
8. If  $\sin \theta = \frac{-1}{3}$  and  $\theta$  does not lie in the 3<sup>rd</sup> quadrant, find the value of  $\cos \theta$ .
9. Find the value of  $\sin^2\left(\frac{\pi}{8} + \frac{A}{2}\right) - \sin^2\left(\frac{\pi}{8} - \frac{A}{2}\right)$ .
10. If  $\sinh x = 3$ , then show that  $x = \log_e (3 + \sqrt{10})$ .
- II. i) Short Answer Type Questions. (5 x 4 = 20)  
ii) Answer any **FIVE** questions.  
iii) Each question carriers **FOUR** marks.
11. Find the adjoint matrix and inverse matrix of the matrix  $\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ .
12. In  $\triangle ABC$ , if O is the circumcentre and H is the orthocentre, then show that  
(i)  $\vec{OA} + \vec{OB} + \vec{OC} = \vec{OH}$                       (ii)  $\vec{HA} + \vec{HB} + \vec{HC} = 2\vec{HO}$
13. If  $[\vec{b}\vec{c}\vec{d}] + [\vec{c}\vec{a}\vec{d}] + [\vec{a}\vec{b}\vec{d}] = [\vec{a}\vec{b}\vec{c}]$ , then show that the points with position vectors  $\vec{a}, \vec{b}, \vec{c}, \vec{d}$  are coplanar.
14. If a, b, c are non zero real numbers and  $\alpha, \beta$  are the solutions of the equation  $a \cos \theta + b \sin \theta = c$  then show that  
i)  $\sin \alpha + \sin \beta = \frac{2bc}{a^2 + b^2}$                       ii)  $\sin \alpha \cdot \sin \beta = \frac{c^2 - a^2}{a^2 + b^2}$ .

15. If  $0 < \theta < \pi$ , solve  $\cos \theta \cos 2\theta \cos 3\theta = 1/4$ .
16. If  $\cos^{-1}p + \cos^{-1}q + \cos^{-1}r = \pi$ , then prove that  $p^2 + q^2 + r^2 + 2pqr = 1$ .
17. Prove that  $r(r_1 + r_2 + r_3) = ab + bc + ca - s^2$ .

III. i) Long Answer Type Questions.

(5 x 7 = 35)

ii) Answer any **FIVE** questions.

iii) Each question carries **SEVEN** marks.

18. If  $f : A \rightarrow B$ ,  $g : B \rightarrow C$  are two bijections, then prove that  $(g \circ f)^{-1} : f^{-1} \circ g^{-1}$ .
19. Use mathematical induction to prove that  $3 \cdot 5^{2n+1} + 2^{3n+1}$  is divisible by 17.

20. If  $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$  and  $\begin{vmatrix} a & a^2 & 1 \\ b & b^2 & 1 \\ c & c^2 & 1 \end{vmatrix} \neq 0$  then show that  $abc = -1$ .

21. Solve the following system of equations by Gauss Jordan method  
 $x + y + z = 3$ ,  $2x + 2y - z = 3$ ,  $x + 2y - z = 1$ .

22. In any triangle, prove that the altitudes are concurrent.

23. In triangle ABC, prove that  $\cos \frac{A}{2} + \cos \frac{B}{2} + \cos \frac{C}{2} = 4 \cos \left( \frac{\pi - A}{4} \right) \cos \left( \frac{\pi - B}{4} \right) \cos \left( \frac{\pi - C}{4} \right)$ .

24. Prove that  $a^3 \cos(B - C) + b^3 \cos(C - A) + c^3 \cos(A - B) = 3abc$ .

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