Guess Papers March 2024
Board of Intermediate Education
1st Year MATHS IA (English Medium)

Time ::3 Hrs Total Marks :: 75 M

SECTION-A

I. Answer all the questions. Each question carries '2' marks. **10 x 2 = 20M**

1) If $f(y)=\frac{y}{\sqrt{1-y^2}}, g(y)=\frac{y}{\sqrt{1+y^2}}$ then show that (fog)(y)=y
2) Find the domain of $f(x)=\frac{1}{[x]^2-[x]-2}$
3) Construct a 3x2 matrix whose elements are defined by $a_{ij}=\frac{1}{2}|i-3j|$
4) Find the cofactors of 2 and -5 in the matrix $\begin{bmatrix}-1 & 0 & 5\\ 1 & 2 & -2\\ 4 & -5 & 3\end{bmatrix}$
5) Let $\bar{a}=2\hat{\imath}+4\hat{\jmath}-5\hat{k}, \bar{b}=\hat{\imath}+\hat{\jmath}+\hat{k}, \bar{c}=\hat{\jmath}+2\hat{k}$. Find the unit vector in the opposite direction of a+b+c.
6) If $\bar{a},\bar{b},\bar{c}$ are the position vector of the vertices A, B and C respectively of ΔABC then find the vector equation of the median through the vertex A.
7) Find the angle between the planes $\bar{r}.(2\hat{\imath}-\hat{\jmath}+2\hat{k})=3, \bar{r}.(3\hat{\imath}+6\hat{\jmath}+\hat{k})=4$.
8) Prove that $\frac{\cos 9^0+\sin 9^0}{\cos 9^0-\sin 9^0}=\cot 36^0$
9) Find the range of 7 cosx – 24sinx+5.
10) If coshx=$\frac{5}{2}$, prove that $\cosh 2x=\frac{23}{2}, \sinh 2x=\frac{5\sqrt{21}}{2}$

SECTION-B

II. Answer ANY FIVE questions. Each question carries '4' marks. **5 x 4 = 20M**

11) If A=$\begin{bmatrix}1 & 2 & 2\\ 2 & 1 & 2\\ 2 & 2 & 1\end{bmatrix}$ then show that $A^2-4A-5I=0$
12) If $\bar{a},\bar{b},\bar{c}$ are non-coplanar vectors, then prove that four points $-\bar{a}+4\bar{b}-3\bar{c}$, $3\bar{a}+2\bar{b}-5\bar{c}$, $-3\bar{a}+2\bar{b}+\bar{c}$ are coplanar.
13) If $[\bar{b}\ \bar{c}\ \bar{d}]+[\bar{c}\ \bar{a}\ \bar{d}]+[\bar{a}\ \bar{b}\ \bar{d}]=[\bar{a}\ \bar{b}\ \bar{c}]$ then show that the four points with position vectors $\bar{a},\bar{b},\bar{c},\bar{d}$ are coplanar.

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

15) If tan (π cosx)=cot(π sin x), prove that $\cos\left(x-\frac{\pi}{4}\right)=\pm\frac{1}{2\sqrt{2}}$

16) Prove that $Tan^{-1}\frac{1}{2}+Tan^{-1}\frac{1}{5}+Tan\frac{1}{8}=\frac{\pi}{4}$

17) If $\sin\theta=\frac{a}{b+c}$, then show that $\cos\theta=\frac{2\sqrt{bc}}{b+c}\cos\frac{A}{2}$

SECTION-C

III. Answer ANY FIVE questions. Each question carries '7' marks. 5 x 7 = 35M

18) If f:A→B, g: B→C are two bijections then prove that $(gof)^{-1}=f^{-1}og^{-1}$.

19) Show that $4^3+8^3+12^3+\ldots$.n terms = $16n^2(n+1)^2$ for all n∈N

20) Show that $\begin{vmatrix}-2a & a+b & a+c\\ a+b & -2b & b+c\\ a+c & b+c & -2c\end{vmatrix}=4(a+b)(b+c)(c+a)$

21) Solve the equations x+y+z=9, 2x+5y+7z=52, 2x+y-+z=0 by Cramer's rule

22) If $\bar{a},\bar{b},\bar{c}$ are three vectors then prove that $(\bar{a}\times\bar{b})\times\bar{c}=(\bar{c}.\bar{a})\bar{b}-(\bar{c}.\bar{b})\bar{a}$

23) In ΔABC, Prove that $\sin\frac{A}{2}+\sin\frac{B}{2}+\sin\frac{C}{2}=1+4\sin\left(\frac{\pi-A}{4}\right)\sin\left(\frac{\pi-B}{4}\right)\sin\left(\frac{\pi-C}{4}\right)$

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

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March – 2024

Board of Intermediate Education

Maths 1A Inter-1st Year

SET-2

Time: 3.00Hrs | **CODE No:**
Marks :75

I. ANSWERS THE FOLLOWING QUESTIONS. $10 \times 2 = 20$

1. If $f : R \to R$ *is defined by* $f(x) = 2x + 3$ then show that $f : R \to R$ is a bijection.

2. If $f : R - \{0\} \to R$ *is defined by* $f(x) = x^3 - \frac{1}{x^3}$, then show that $f(x) + f(1/x) = 0$.

3. Define Inverse of a Square matrix. Give example .

4. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$ and 2X+A=B then find X.

5. **If a=2i–j+k, b=i–3j–5k** then find the vector **c** such that **a, b** and **c** from the sides of triangle.

6. Find the vector equation and Cartesian equation to the line passing through the points $2\hat{i} + \hat{j} + 3\hat{k}, -4\hat{i} + 3\hat{j} - \hat{k}$.

7. Find the angle between the planes $\hat{r}.\left(2\hat{i} - \hat{j} + 2\hat{k}\right) = 3, \hat{r}.\left(3\hat{i} + 6\hat{j} + \hat{k}\right) = 4$.

8. If $180^0 < \theta < 270^0$ and $\sin\theta = -4/5$ find the values of $\sin(\theta/2)$ and $\cos(\theta/2)$.

9. Find the period of function $f(x) = \tan\left(x + 4x + 9x + ... + n^2x\right)$, n is a positive integer.

10. If $\sinh x = 3/4$, show that $\cosh 2x = 17/8$ *and* $\sinh 2x = \frac{15}{8}$.

II. ANSWER ANY FIVE OF THE FOLLOWING QUESTIONS. $5 \times 4 = 20$

11. Find the value of x, if $\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{vmatrix} = 0$.

12. If the points whose position vectors are $3\hat{i} - 2\hat{j} - \hat{k},\ 2\hat{i} + 3\hat{j} - 4\hat{k},\ -\hat{i} + \hat{j} + 2\hat{k},\ 4\hat{i} + 5\hat{j} + \lambda\hat{k}$ are coplanar then show that $\lambda = -146/17$.

13. Prove that the smaller angle θ between ant two diagonals of a cube is given by $\cos\theta = 1/3$.

14. Prove that $\sin A \sin\left(60^0 + A\right)\sin\left(60^0 - A\right) = \frac{1}{4}\sin 3A$ and hence deduce that $\sin\frac{\pi}{9}\sin\frac{2\pi}{9}\sin\frac{3\pi}{9}\sin\frac{4\pi}{9} = \frac{3}{16}$.

15. Solve $\cot^2\theta - \left(1+\sqrt{3}\right)\cos\theta + \sqrt{3} = 0\left[0 < \theta < \pi/2\right]$.

16. If $Sin^{-1}x + Sin^{-1}y + Sin^{-1}z = \pi$, prove that $x\sqrt{1-x^2} + y\sqrt{1-y^2} + z\sqrt{1-z^2} = 2xyz$.

17. Show that $\cot A + \cot B + CotC = \frac{a^2 + b^2 + c^2}{4\Delta}$.

III. ANSWER ANY FIVE OF THE FOLLOWING QUESTIONS. $5 \times 7 = 35$

18. If $f : A \to B, g : B \to C$ are two one one onto functions then show that $gof : A \to C$ is also one one onto .

19. By using mathematical induction, prove that $3.5^{2n+1} + 2^{3n+1}$ is divisible by 17.

20. Show that $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2\left(a+b+c\right)^3$

21. Examine whether the following system of equations $x + y + z = 1, 2x + y + z = 2, x + 2y + 2z = 1$ are consistent or inconsistent and if consistent find the complete solution.

22. If $\bar{a} = \hat{i} - 2\hat{j} + 3\hat{k}, \bar{b} = 2\hat{i} + \hat{j} + \hat{k}, \bar{c} = \hat{i} + \hat{j} + 2\hat{k}$ then find $\left|\left(\bar{a} \times \bar{b}\right) \times \bar{c}\right|$ and $\left|\bar{a} \times \left(\bar{b} \times \bar{c}\right)\right|$.

23. If $A + B + C = 180^0$, prove that $\cos 2A + \cos B + \cos 2C = -1 - 4\cos A \cos B \cos C$

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

THE END