# BOARD OF INTERMEDIATE EDUCATION

## JUNIOR INTER MATHEMATICS PAPER – 1(A)

## MODEL PAPER (ENGLISH VERSION)

**TIME: 3 HOURS** **MAX.MARKS: 75**

### SECTION – A

**I. i) Very Short Answer Type questions.**

**ii) Answer ALL questions.**

**iii) Each question carries TWO marks.** **$10 \times 2 = 20$**

1. Find the domain of the real valued function $f(x) = \sqrt{2-x} + \sqrt{1+x}$
2. If $f = \{(1, 2), (2, -3), (3, -1)\}$ then find i) $2f$ ii) $\sqrt{f}$.
3. If $A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 3 & 4 \\ 5 & -6 & x \end{pmatrix}$ and $\det A = 45$ then find 'x'.
4. Find the adjoint and the inverse of the matrix $\begin{bmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$
5. If the vectors $-3\bar{i} + 4\bar{j} + \lambda\bar{k}$ and $\mu\bar{i} + 8\bar{j} + 6\bar{k}$ are collinear vectors then find '$\lambda$' and '$\mu$'.
6. Find the vector equation of the plane passing through the point (0, 0, 0), (0, 5, 0) and (2, 0, 1).
7. Find the area of the parallelogram having $2\bar{i} - 3\bar{j}$ and $3\bar{i} - \bar{k}$ are adjacent sides.
8. Find the period of the function $f(x) = \tan\left(x + 4x + 9x + ....... + n^2x\right)$ (n is +ve integer).
9. If $\cos A = \sqrt{\dfrac{\sqrt{2}+1}{2\sqrt{2}}}$, find the value of cos 2A.
10. For any $x \in R$ prove that $\cosh^4 x - \sinh^4 x = \cosh(2x)$.

### SECTION – B

**II. i) Short Answer Type questions.**

**ii) Answer any FIVE questions.**

**iii) Each question carries FOUR marks.** **$5 \times 4 = 20$**

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 $3\bar{i} - 2\bar{j} - \bar{k}$, $2\bar{i} + 3\bar{j} - 4\bar{k}$, $-\bar{i} + \bar{j} + 2\bar{k}$ and $4\bar{i} + 5\bar{j} + \lambda\bar{k}$ are coplanar, then show that $\lambda = \dfrac{-146}{17}$.
13. Find the unit vector perpendicular to the plane passing through the points (1, 2, 3), (2, −1, 1) and (1, 2, −4).

**14.** Prove that $\sin\frac{\pi}{5}\sin\frac{2\pi}{5}\sin\frac{3\pi}{5}\sin\frac{4\pi}{5}=\frac{5}{16}$.

**15.** If $\theta_1, \theta_2$ are solutions of the equation $a\cos 2\theta + b\sin 2\theta = c$, $\tan\theta_1 \neq \tan\theta_2$ and $a + c \neq 0$, then find the value of

i) $\tan\theta_1 + \tan\theta_2$ ii) $\tan\theta_1 . \tan\theta_2$

**16.** Prove that $\sin^{-1}\left(\frac{4}{5}\right)+\sin^{-1}\left(\frac{7}{25}\right)=\sin^{-1}\left(\frac{117}{125}\right)$.

**17.** $\cot A + \cot B + \cot C = \frac{a^2+b^2+c^2}{4\Delta}$

## SECTION – C

**III. i) Long Answer Type questions.**

**ii) Answer any FIVE questions.**

**iii) Each question carries SEVEN marks.** **$5 \times 7 = 35$**

**18.** Let $f : A \to B$ be a bijection. Then show that $fof^{-1} = I_B$ and $f^{-1}of = I_A$

**19.** Show that $3.5^{2n+1} + 2^{3n+1}$ is divisible by 17, $\forall\, n \in N$.

**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 simultaneous linear equation by using Cramer's rule $2x - y + 3z = 9$, $x + y + z = 6$, $x - y + z = 2$.

**22.** Show that in any triangle the altitudes are concurrent.

**23.** If $A + B + C = 180°$, then prove that $\cos^2\frac{A}{2}+\cos^2\frac{B}{2}+\cos^2\frac{C}{2}=2\left(1+\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}\right)$

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