BOARD OF INTERMEDIATE EDUCATION

JUNIOR INTER MATHEMATICS

MODEL PAPER - 1(A) (English Medium)

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 × 2 = 20**

1. Find the inverse of $f : R \longrightarrow (0, \infty)$ defined by $f(x) = 5^x$

2. Find the domain and range of $f(x) = |x| + |1 + x|$.

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

4. If $A = \begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 2 & 3 & 4 \end{pmatrix}$; $B = \begin{pmatrix} 1 & -2 \\ -1 & 0 \\ 2 & -1 \end{pmatrix}$ then find AB and BA.

5. If $\bar{a} = 2\bar{i} + 5\bar{j} + \bar{k}$ and $\bar{b} = 4\bar{i} + m\bar{j} + n\bar{k}$ are collinear vectors, then find m and n.

6. ABCDE is a pentagon. If $\overline{AB} + \overline{AE} + \overline{BC} + \overline{DC} + \overline{ED} + \overline{AC}$ is $\lambda.\overline{AC}$, then find λ.

7. If $\bar{a} = (1, 2, 3)$, $\bar{b} = (2, 3, 4)$, $\bar{c} = (3, 4, 5)$, then find $(\bar{a} \times \bar{b}) \times (\bar{a} \times \bar{c})$.

8. Simplify $\dfrac{1 - \cos\theta + \sin\theta}{1 + \cos\theta + \sin\theta}$ in terms of $\tan\dfrac{\theta}{2}$

9. Find the period of $f(x) = \dfrac{\sin x + \cos x}{\sin x - \cos x}$

10. If $\sin hx = 2$, then find $\sin h2x + \cos h2x$.

Section – B

II. **i)** **Short** answer type questions.

ii) Answer any **FIVE** questions.

iii) Each question carries **FOUR** marks. **5 × 4 = 20**

11. Prove: $\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix} = (a - b)(b - c)(c - a)(ab + bc + ca)$

12. Find the vector equation of a plane passing through the points (1, 1, 1), (2, 2, −1), (3, −1, 2).

13. If $\bar{a} = (2, 3, -1)$, $\bar{b} = (3, 1, -4)$, $\bar{c} = (0, 1, 5)$ then find $[\bar{a} \times (\bar{b} \times \bar{c})]$. $(\bar{a} \times \bar{c})$

14. Prove: $\sin^2\left(\alpha - \frac{\Pi}{4}\right) + \sin^2\left(\alpha + \frac{\Pi}{12}\right) - \sin^2\left(\alpha - \frac{\Pi}{12}\right) = \frac{1}{2}$

15. Solve: $2\cos^2\theta - \sqrt{3}\sin\theta + 1 = 0$.

16. Prove: $\cos\left[\tan^{-1}\left[\sin\left(\cot^{-1} x\right)\right]\right] = \sqrt{\frac{x^2+1}{x^2+2}}$

17. In ΔABC, prove $\sin\frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{bc}}$; $\cos\frac{A}{2} = \sqrt{\frac{s(s-a)}{bc}}$

SECTION – C

III. i) Long answer type questions.

ii) Answer any **FIVE** questions.

iii) Each question carries **SEVEN** marks. **5 × 7 = 35**

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

19. By using mathematical induction for $n \in N$,

prove $\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \ldots$ n terms $= \frac{n}{3n+1}$

20. If $A = \begin{pmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{pmatrix}$, then show that $A^{-1} = A^3$.

21. Solve by matrix inversion method: $x + y + z = 2$; $2x - 3z = 4$; $3y + 4z = 0$.

22. Prove: $(\bar{a} \times \bar{b}) \times \bar{c} = (\bar{c} \cdot \bar{a})\,\bar{b} - (\bar{c} \cdot \bar{b})\,\bar{a}$

23. Prove: $\frac{1 - \sec 8\alpha}{1 - \sec 4\alpha} = \frac{\tan 8\alpha}{\tan 2\alpha}$

24. Prove in ΔABC, $r_1 + r_2 + r_3 - r = 4R$.