BOARD OF INTERMEDIATE EDUCATION (AP)

HALF YEARLY EXAMINATIONS - 2021

JUNIOR INTER MATHEMATICS - IA

MODEL PAPER (English Version)

Time: 3 Hours **Max.Marks: 75**

SECTION - A

Note: i) Very short answer type questions. **$10 \times 2 = 20$**

ii) Answer All question.

iii) Each question carries Two marks.

1. If A = $\{-2, -1, 0, 1, 2\}$ and f: $A \to B$ is a surjection defined by $f(x) = x^2 + x + 1$ then find B.

2. Let $f(x) + x^2$, $g(x) = 2^x$ then solve the equation $(fog)(x) = (gof)(x)$

3. Find the domain of the real valued function $f(x) = log(x^2 - 4x + 3)$

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 $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$ is a symmetric matrix then find x.

6. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ then show that $AA' = A'A = I$

7. Find the value of tan 480°.

8. Find the period of the function $\cos\left(\frac{4x + 9}{5}\right)$.

9. If sinhx = 3 then show that $x = log_e (3 + \sqrt{10})$.

10. Prove that $\cosh^4 x - \sinh^4 x = \cosh(2x)$.

SECTION - B

Note: i) Short answer type questions. **$5 \times 4 = 20$**

ii) Answer any Five questions.

iii) Each question carries Four marks.

11. If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $E = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ then show that $(aI + bE)^3 = a^3I + 3a^2bE$, where I is unit matrix of order 2.

12. If $3A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ then show that $A^{-1} = A'$.

13. Show that $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$ is non-singular and find A^{-1}.

14. Prove that $(\tan\theta + \cot\theta)^2 = \sec^2\theta + \mathrm{cosec}^2\theta = \sec^2\theta . \mathrm{cosec}^2\theta$

15. If $\tan 20° = p$ then prove that $\dfrac{\tan 610° + \tan 700°}{\tan 560° - \tan 470°} = \dfrac{1 - p^2}{1 + p^2}$

16. If $A + B = \dfrac{\pi}{4}$ then prove that

i) $(1 + \tan A)(1 + \tan B) = 2$

ii) $(\cot A - 1)(\cot B - 1) = 2$

17. Evaluate $\sin^2 82\frac{1}{2}° - \sin^2 22\frac{1}{2}°$.

SECTION - C

Note: i) Long answer type questions. **$5 \times 7 = 35$**

ii) Answer any Five questions.

iii) Each question carries Seven marks.

18. If $f = \{(4, 5), (5, 6), (6, -4)\}$ and $g = \{(4, -4), (6, 5), (8, 5)\}$ then find

i) $f + g$ ii) $f - g$ iii) $2f + 4g$ iv) $f + 4$ v) fg vi) $\dfrac{f}{g}$ vii) $|f|$

19. If 'f' and 'g' are real valued functions defined by $f(x) = 2x - 1$ and $g(x) = x^2$ then find

i) $(3f - 2g)(x)$ ii) $(fg)(x)$ iii) $\left(\dfrac{\sqrt{f}}{g}\right)(x)$ iv) $(f + g + 2)(x)$

20. Solve the following simultaneous linear equations by using Cramer's rule

$3x + 4y + 5z = 18,\ 2x - y + 8z = 13,\ 5x - 2y + 7z = 20$

21. Solve $x + y + z = 9,\ 2x + 5y + 7z = 52,\ 2x + y - z = 0$ by using matrix inversion method.

22. If A, B, C are angles in a triangle then prove that

$\sin A + \sin B - \sin C = 4 \sin\dfrac{A}{2} \sin\dfrac{B}{2} \cos\dfrac{C}{2}$

23. If $A + B + C = \dfrac{\pi}{2}$ then prove that $\cos 2A + \cos 2B + \cos 2C = 1 + 4 \sin A \sin B \sin C$

24. If $A + B + C = 0$ then prove that $\cos^2 A + \cos^2 B + \cos^2 C = 1 + 2 \cos A \cos B \cos C$

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