BOARD OF INTERMEDIATE EDUCATION (AP)

HALF YEARLY EXAMINATIONS - 2021

JUNIOR INTER MATHEMATICS - IA

MODEL PAPER - 2 (English Version)

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

SECTION − A

Note: i) Very short answer type questions.   **10 × 2 = 20**

   ii) Answer All questions.

   iii) Each question carries 2 marks.

1. If $A = \left\{0, \dfrac{\pi}{6}, \dfrac{\pi}{4}, \dfrac{\pi}{3}, \dfrac{\pi}{2}\right\}$ and $f : A \to B$ is a surjection defined by $f(x) = \cos x$, then find B.

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

3. Find the domain of the real valued function $f(x) = \sqrt{x^2 - 25}$

4. If $\begin{bmatrix} x - 3 & 2y - 8 \\ z + 2 & 6 \end{bmatrix} = \begin{bmatrix} 5 & 2 \\ -2 & a - 4 \end{bmatrix}$ then find the values of x, y, z and a.

5. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ then find A^2.

6. For any square matrix A, show that AA' is symmetric.

7. If $\sin\theta = \dfrac{4}{5}$ and θ is not in the first quadrant, find the value of $\cos\theta$.

8. Find the period of $f(x) = \tan(x + 4x + 9x + ... + n^2x)$. (n any +ve integer)

9. If $\sinh x = \dfrac{3}{4}$, then find $\cosh(2x)$.

10. Show that $\tanh^{-1}\left(\dfrac{1}{2}\right) = \dfrac{1}{2}\log_e 3$

SECTION − B

Note: i) Short answer type questions.   **5 × 4 = 20**

   ii) Answer any Five questions.

   iii) Each question carries 4 marks.

11. If $A = \begin{bmatrix} 1 & -2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$ then find $A^3 - 3A^2 - A - 3I$, where I is unit matrix of order 3.

12. If A = $\begin{bmatrix} 1 & 5 & 3 \\ 2 & 4 & 0 \\ 3 & -1 & -5 \end{bmatrix}$ and B = $\begin{bmatrix} 2 & -1 & 0 \\ 0 & -2 & 5 \\ 1 & 2 & 0 \end{bmatrix}$ then find 3A − 4B'.

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

14. If 3 sinA + 5 cosA = 5, then show that 5 sinA − 3 cosA = ±3.

15. If $0 < A < B < \dfrac{\pi}{4}$, sin(A + B) = $\dfrac{24}{25}$ and cos (A − B) = $\dfrac{4}{5}$, then find the value of tan2A.

16. Prove that $\dfrac{1}{\sin 10} - \dfrac{\sqrt{3}}{\cos 10} = 4$.

17. If A is not an integral multiple of π, then prove that cosA.cos2A.cos4A.cos8A = $\dfrac{\sin 16A}{16 \sin A}$

and hence deduce that $\cos \dfrac{2\pi}{15} . \cos \dfrac{4\pi}{15} . \cos \dfrac{8\pi}{15} . \cos \dfrac{16\pi}{15} = \dfrac{1}{16}$

SECTION − C

Note: i) Long answer type questions. 5 × 7 = 35

    ii) Answer any Five questions.

    iii) Each question carries 7 marks.

18. i) If f(x) = $\dfrac{\cos^2 x + \sin^4 x}{\sin^2 x + \cos^4 x}$ $\forall$ x $\in$ R then show that f(2012) = 1.

    ii) If f(x) = 2x − 1, g(x) = $\dfrac{x + 1}{2}$ for all x $\in$ R, then find (gof)(x).

19. If f(x) = x^2 and g(x) = $|x|$, then find the following functions.

    i) f + g   ii) f − g   iii) fg   iv) 2f   v) f^2 vi) f + 3

20. Solve the following system of equations by using Cramer's Rule

    2x − y + 3z = 9, x + y + z = 6, x − y + z = 2.

21. Solve 3x + 4y + 5z = 18, 2x − y + 8z = 13 and 5x − 2y + 7z = 20 by using matrix inversion method.

22. If A, B, C are angles in a triangle, then prove that sinA + sinB + sinC = $4 \cos \dfrac{A}{2} \cos \dfrac{B}{2} \cos \dfrac{C}{2}$.

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

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

    $\sin \dfrac{A}{2} + \sin \dfrac{B}{2} + \sin \dfrac{C}{2} = 1 + 4 \sin\left(\dfrac{\pi - A}{4}\right) \sin\left(\dfrac{\pi - B}{4}\right) \sin\left(\dfrac{\pi - C}{4}\right)$.

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