B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

MID-APRIL TEST 2025-26
MATHEMATICS

Class: X | **Time: 1hr**
Date: 22.04.25 | **Max Marks: 25**
Admission no: | **Roll no:**

General Instructions:

1. This Question Paper has 4 Sections A, B, C and D.
2. Section A has 5 MCQs carrying 1 mark each
3. Section B has 2 questions carrying 02 marks each.
4. Section C has 2 questions carrying 03 marks each.
5. Section D has 2 questions carrying 05 marks each.
6. All Questions are compulsory.

SECTION A

1. If sin 2B = 2 sin B is true when B is equal to — 1
(a) 90°
(b) 60°
(c) 30°
(d) 0°

2. $5\tan^2 A - 5\sec^2 A + 1$ is equal to — 1
(a) 6
(6) -5
(c) 1
(d) -4

3. What is the minimum value of cos θ, $0 \le \theta \le 90°$ — 1
(a) -1
(b) 0
(c) 1
(d) 1/2

4. If in ΔABC, ∠C = 90°, then sin (A + B) = — 1
(a) 0
(b) 1/2
(c) 1/√2
(d) 1

5. If sin A – cos A = 0, then the value of $\sin^4 A + \cos^4 A$ is — 1
(a) 2
(b) 1
(c) 3/4
(d) ½

SECTION B

6. If tan α = √3 and tan β = 1/√3, 0 < α, β < 90°, find the value of cot (α + β). — 2

A:- Solution:

$\tan \alpha = \sqrt{3} = \tan 60°$ ...(i)

$\tan \beta = \frac{1}{\sqrt{3}} = \tan 30°$ ...(ii) 1

Solving (i) & (ii), $\alpha = 60°$ and $\beta = 30°$

$\therefore \cot(\alpha + \beta) = \cot(60° + 30°) = \cot 90° = 0$ 1

7. If θ = 45°, then what is the value of $2\sec^2\theta + 3\,\text{cosec}^2\theta$? 2

A:- Solution:

$2\sec^2\theta + 3\,\text{cosec}^2\theta = 2\sec^2 45° + 3\,\text{cosec}^2 45°$ 1

$= 2(\sqrt{2})^2 + 3(\sqrt{2})^2 = 4 + 6 = 10$ 1

SECTION C

8. Prove that 3

$$\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$$

A:-

$$\text{LHS} = \frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$$

$$= \frac{\sin\theta(1 - 2\sin^2\theta)}{\cos\theta(2\cos^2\theta - 1)}$$ 1

$$= \frac{\sin\theta(\sin^2\theta + \cos^2\theta - 2\sin^2\theta)}{\cos\theta(2\cos^2\theta - \sin^2\theta - \cos^2\theta)}$$ 1

$$= \frac{\sin\theta(\cos^2\theta - \sin^2\theta)}{\cos\theta(\cos^2\theta - \sin^2\theta)}$$

$$= \frac{\sin\theta}{\cos\theta} = \tan\theta = \text{RHS.}$$ 1

9. If tan (A + B) = √3 and tan (A – B) = 1/√3; 0° < A + B ≤ 90°; A > B, find A and B. 3

A:- Solution:

$\tan(A + B) = \sqrt{3} = \tan 60°$

$\Rightarrow A + B = 60°$ ...(i) 1

$\tan(A - B) = \frac{1}{\sqrt{3}} = \tan 30°$

$\Rightarrow A - B = 30°$ ...(ii)

On Adding equation (i) and (ii), we get 1

$2A = 90° \Rightarrow A = 45°$

From (i), we get:

$45° + B = 60° \Rightarrow B = 15°$

Thus, A = 45°, B = 15° 1

SECTION D

10. Prove that $\frac{\tan\theta}{1 - \cot\theta} + \frac{\cot\theta}{1 - \tan\theta} = 1 + \sec\theta\,\text{cosec}\,\theta$ 5

A:-

$$\text{LHS} = \frac{\tan\theta}{1 - \cot\theta} + \frac{\cot\theta}{1 - \tan\theta}$$

$$= \frac{\frac{\sin\theta}{\cos\theta}}{1 - \frac{\cos\theta}{\sin\theta}} + \frac{\frac{\cos\theta}{\sin\theta}}{1 - \frac{\sin\theta}{\cos\theta}}$$ 1

$$= \frac{\sin\theta \times \sin\theta}{\cos\theta(\sin\theta - \cos\theta)} + \frac{\cos\theta \times \cos\theta}{\sin\theta(\cos\theta - \sin\theta)}$$

$$= \frac{\sin^2\theta}{\cos\theta(\sin\theta - \cos\theta)} - \frac{\cos^2\theta}{\sin\theta(\sin\theta - \cos\theta)}$$ 1

$$= \frac{\sin^3\theta - \cos^3\theta}{\cos\theta\sin\theta(\sin\theta - \cos\theta)}$$

$$= \frac{(\sin\theta - \cos\theta)\begin{pmatrix}\sin^2\theta + \cos^2\theta \\ + \sin\theta\cos\theta\end{pmatrix}}{\cos\theta\sin\theta(\sin\theta - \cos\theta)}$$ 1

$$= \frac{\sin^2\theta + \cos^2\theta + \sin\theta\cos\theta}{\cos\theta\sin\theta}$$

$$= \frac{\sin\theta\cos\theta + 1}{\cos\theta\sin\theta}$$ 1

$$= \frac{\sin\theta\cos\theta}{\cos\theta\sin\theta} + \frac{1}{\cos\theta} \times \frac{1}{\sin\theta}$$

$$= 1 + \frac{1}{\cos\theta}\frac{1}{\sin\theta}$$

$$= 1 + \sec\theta\,\mathrm{cosec}\,\theta = \text{RHS.}$$

Hence, **proved**. 1

11. Find value of 5

$$\frac{\sin 30^\circ + \tan 45^\circ - \mathrm{cosec}\, 60^\circ}{\sec 30^\circ + \cos 60^\circ + \cot 45^\circ}$$

A:-

$$= \frac{\frac{1}{2} + 1 - \frac{2}{\sqrt{3}}}{\frac{2}{\sqrt{3}} + \frac{1}{2} + 1} = \frac{\frac{\sqrt{3} + 2\sqrt{3} - 4}{2\sqrt{3}}}{\frac{4 + \sqrt{3} + 2\sqrt{3}}{2\sqrt{3}}}$$ 2

$$= \frac{\sqrt{3} + 2\sqrt{3} - 4}{4 + \sqrt{3} + 2\sqrt{3}} = \frac{3\sqrt{3} - 4}{4 + 3\sqrt{3}} \times \frac{4 - 3\sqrt{3}}{4 - 3\sqrt{3}}$$

$$= \frac{12\sqrt{3} - 27 - 16 + 12\sqrt{3}}{-11} = \frac{24\sqrt{3} - 43}{-11}$$ 2

$$= \frac{\mathbf{43 - 24\sqrt{3}}}{\mathbf{11}}.$$ 1

************BEST OF LUCK***********