

Dear student following is an Easy level [O ● O O O] test paper. Score of 15 Marks in 10 Minutes would be a satisfactory performance. Questions 1-9(+3,-1). (Questions may have more than one option correct)

- Q.1** Column Matching (1 - 4) :
 If $\sin 2\theta = K$
- (i) $\operatorname{cosec} 2\theta + \cot 2\theta \cos 2\theta$ (a) $\frac{1+K}{1-K}$
- (ii) $\left(\frac{1+\tan\theta}{1-\tan\theta}\right)^2$ (b) $K^2 + K - 1$
- (iii) $\sin 2\theta - \frac{1}{2}(1 + \cos 4\theta)$ (c) $3K - 4K^3$
- (iv) $\sin 6\theta$ (d) $\frac{2-K^2}{K}$
- (A) (i)-(d), (ii)-(a), (iii)-(b), (iv)-(c)
 (B) (i)-(a), (ii)-(d), (iii)-(c), (iv)-(b)
 (C) (i)-(c), (ii)-(a), (iii)-(b), (iv)-(d)
 (D) (i)-(b), (ii)-(c), (iii)-(d), (iv)-(a)

- Q.2** (i) $\cos 2A = \sin 3A$ (a) $A = 22\frac{1}{2}^\circ$
 (ii) $\cos 3A = \sin 7A$ (b) $A = 30^\circ$
 (iii) $\tan A = \cot 3A$ (c) $A = 9^\circ$
 (iv) $\cot A = \tan 2A$ (d) $A = 18^\circ$
- (A) (i)-(d), (ii)-(a), (iii)-(b), (iv)-(c)
 (B) (i)-(a), (ii)-(d), (iii)-(c), (iv)-(b)
 (C) (i)-(c), (ii)-(a), (iii)-(b), (iv)-(d)
 (D) (i)-(d), (ii)-(c), (iii)-(a), (iv)-(b)

- Q.3** If $\cos x - \sin x = (1/2)$
- (i) $\cos x + \sin x$ (a) $(3/4)$
- (ii) $\sin 2x$ (b) $\frac{(\sqrt{7} + 1)}{4}$
- (iii) $\cos 2x$ (c) $\frac{\sqrt{7}}{4}$
- (iv) $\cos x$ (d) $\frac{\sqrt{7}}{2}$
- (A) (i)-(d), (ii)-(a), (iii)-(b), (iv)-(c)
 (B) (i)-(d), (ii)-(a), (iii)-(c), (iv)-(b)
 (C) (i)-(c), (ii)-(a), (iii)-(b), (iv)-(d)
 (D) (i)-(d), (ii)-(c), (iii)-(a), (iv)-(b)

- Q.4** $\frac{\sin 3\alpha}{\cos 2\alpha}$ is
- (i) positive (a) $\alpha \in \left(\frac{13\pi}{48}, \frac{14\pi}{48}\right)$
- (ii) negative (b) $\alpha \in \left(\frac{14\pi}{48}, \frac{18\pi}{48}\right)$
- (iii) positive or negative (c) $\alpha \in \left(\frac{18\pi}{48}, \frac{23\pi}{48}\right)$
- (A) (i)-(c), (ii)-(b), (iii)-(a)
 (B) (i)-(b), (ii)-(a), (iii)-(c)
 (C) (i)-(c), (ii)-(a), (iii)-(b)
 (D) (i)-(a), (ii)-(c), (iii)-(b)

Please read short write up and answer subsequent questions (5 - 7)

x, y, z are respectively the sines and p, q, r are respectively the cosines of the angles α, β, γ which are in A.P. with common difference $2\pi/3$.

- Q.5** $x + y + z$ is equal to
- (A) 0 (B) 1
 (C) $p + q + r$ (D) None of these

- Q.6** $yz + zx + xy$ is equal to
- (A) $p + q + r$ (B) $x + y + z$
 (C) $-(3/4)$ (D) $-(3/8)$

- Q.7** Value of the determinant $\begin{vmatrix} x & y & z \\ p & q & r \\ yz & zx & xy \end{vmatrix}$ is equal to
- (A) 0 (B) $x + y + z$
 (C) $p + q + r$ (D) $3\sqrt{3} / 8$

- Q.8** The angle A of the ΔABC is obtuse. $x = 2635 - \tan B \tan C$, if $[x]$ denotes the greatest integer function, the value of $[x]$ is
- (A) 2643 (B) 2634 (C) 2364 (D) 2463

- Q.9** If $498 [16 \cos x + 12 \sin x] = 2k + 60$, then the maximum value of k is
- (A) 4590 (B) 4095 (C) 4450 (D) 4950



MATHEMATICS IIT JEE (JUNE 4th WEEK CLASS TEST 1) (TRIGONOMETRY) ANSWER

Name : Roll No. :

	A	B	C	D		A	B	C	D		A	B	C	D
1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9
Ans.	A	D	B	C	A,C	C	D	B	D

SOLUTIONS

Sol.1 (A)

$$(i) \operatorname{cosec} 2\theta + \cot 2\theta \cos 2\theta$$

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

$$(ii) \left(\frac{1 + \tan \theta}{1 - \tan \theta} \right)^2 = \left(\frac{1 + \sin 2\theta}{1 - \sin 2\theta} \right) = \frac{1 + K}{1 - K} = (a)$$

$$(iii) \sin 2\theta - \frac{1}{2}(1 + \cos 4\theta) = \sin 2\theta - \cos^2 2\theta$$

$$= \sin 2\theta - 1 + \sin^2 2\theta = K^2 + K - 1 = (b)$$

$$(iv) \sin 6\theta = 3 \sin 2\theta - 4 \sin^3 \theta$$

$$= 3K - 4K^3 = (c)$$

Sol.2 (D)

$$(i) 2A + 3A = 90^\circ$$

$$\Rightarrow A = 18^\circ$$

$$(ii) 3A + 7A = 90^\circ$$

$$\Rightarrow A = 9^\circ$$

$$(iii) A + 3A = 90^\circ$$

$$\Rightarrow A = 22\frac{1}{2}^\circ$$

$$(iv) A + 2A = 90^\circ$$

$$\Rightarrow A = 30^\circ$$

Sol.3 (B)

$$\cos x - \sin x = \frac{1}{2}$$

$$\Rightarrow 1 - 2 \sin x \cos x = \frac{1}{4}$$

$$\Rightarrow \sin 2x = \frac{3}{4}$$

$$\Rightarrow (\cos x + \sin x)^2 = 1 + \frac{3}{4} = \frac{7}{4}$$

$$\Rightarrow \cos x + \sin x = \frac{\sqrt{7}}{2}$$

$$\Rightarrow 2 \cos x = \frac{1}{2} + \frac{\sqrt{7}}{2}$$

$$\Rightarrow \cos x = \frac{(\sqrt{7} + 1)}{4}$$

$$\cos 2x = \frac{1}{2} \times \frac{\sqrt{7}}{2} = \frac{\sqrt{7}}{4}$$

Sol.4 (C)

$$\alpha \in \left(\frac{13\pi}{48}, \frac{14\pi}{48} \right)$$

$$\Rightarrow 3\alpha \in \left(\frac{13\pi}{16}, \frac{14\pi}{16} \right)$$

$$= \left(\pi - \frac{3\pi}{16}, \pi - \frac{2\pi}{16} \right)$$

i.e., $3\alpha \in$ II quadrant $\Rightarrow \sin 3\alpha > 0$

$$2\alpha \in \left(\frac{13\pi}{24}, \frac{14\pi}{24} \right) = \left(\pi - \frac{11\pi}{24}, \pi - \frac{10\pi}{24} \right)$$

i.e., $2\alpha \in$ II quadrant $\Rightarrow \cos 2\alpha < 0$

$\therefore \frac{\sin 3\alpha}{\cos 2\alpha}$ is negative.

Similarly $\alpha \in \left(\frac{14\pi}{48}, \frac{18\pi}{48} \right)$

$$\Rightarrow 3\alpha \in \left(\pi - \frac{2\pi}{2}, \pi + \frac{2\pi}{16} \right)$$

$\Rightarrow \sin 3\alpha$ can be positive or negative.

$$2\alpha \in \left(\pi - \frac{10\pi}{24}, \pi - \frac{61\pi}{24} \right) \cos 2\alpha \text{ is negative.}$$

So $\frac{\sin 3\alpha}{\cos 2\alpha}$ can be positive or negative.

Sol.5 (A, C)

$$x + y + z = \sin \alpha + \sin \left(\alpha + \frac{2\pi}{3} \right) + \sin \left(\alpha + \frac{4\pi}{3} \right)$$

$$= \sin \alpha + \sin \left(\alpha + \frac{4\pi}{3} \right) + \sin \left(\alpha + \frac{2\pi}{3} \right)$$

$$= 2 \sin \left(\alpha + \frac{2\pi}{3} \right) \cos \left(\frac{2\pi}{3} \right) + \sin \left(\alpha + \frac{2\pi}{3} \right)$$

$$= -2 \sin \left(\alpha + \frac{2\pi}{3} \right) \left(\frac{1}{2} \right) + \sin \left(\alpha + \frac{2\pi}{3} \right) = 0$$

Similarly $p + q + r = 0$

Sol.6 (C)

$$yz + zx + xy = \sin \alpha \sin \left(\alpha + \frac{2\pi}{3} \right) + \sin \left(\alpha + \frac{2\pi}{3} \right)$$

$$\sin \left(\alpha + \frac{4\pi}{3} \right) + \sin \left(\alpha + \frac{4\pi}{3} \right) \sin \alpha$$

$$= \frac{1}{2} \left[\cos \left(\frac{2\pi}{3} \right) - \cos \left(2\alpha + \frac{2\pi}{3} \right) + \cos \left(\frac{2\pi}{3} \right) \right.$$

$$\left. - \cos \left(2\alpha + \frac{6\pi}{3} \right) + \cos \left(\frac{4\pi}{3} \right) - \cos \left(2\alpha + \frac{4\pi}{3} \right) \right]$$

$$= \frac{1}{2} \left[-\frac{3}{2} + 2 \cos 2\alpha \cos \left(\frac{\pi}{3} \right) - \cos 2\alpha \right]$$

$$= -\frac{3}{4}$$

Sol.7 (D)

$$\begin{vmatrix} x & y & z \\ p & q & r \\ yz & zx & xy \end{vmatrix} = \begin{vmatrix} x+y+z & y & z \\ p+q+r & q & r \\ yz+zx+xy & zx & xy \end{vmatrix}$$

$$(C_1 \rightarrow C_1 + C_2 + C_3)$$

$$= \begin{vmatrix} 0 & y & z \\ 0 & q & r \\ -(3/4) & zx & xy \end{vmatrix}$$

$$= -\left(\frac{3}{4}\right) (yr - qz)$$

$$= -\left(\frac{3}{4}\right) \left[\sin \left(\alpha + \frac{2\pi}{3} \right) \cos \left(\alpha + \frac{4\pi}{3} \right) \right.$$

$$\left. - \cos \left(\alpha + \frac{2\pi}{3} \right) \sin \left(\alpha + \frac{4\pi}{3} \right) \right]$$

$$= -\left(\frac{3}{4}\right) \sin \left(-\frac{2\pi}{3} \right)$$

$$= \left(\frac{3}{4}\right) \left(\frac{\sqrt{3}}{2}\right) = \frac{3\sqrt{3}}{8}$$

Sol.8 (B)

$$A > \frac{\pi}{2}$$

$$\Rightarrow B + C < \frac{\pi}{2}$$

$$\Rightarrow \tan (B + C) > 0$$

$$\Rightarrow \frac{\tan B + \tan C}{1 - \tan B \tan C} > 0$$

$$\Rightarrow \tan B \tan C < 1 \text{ as } \tan B > 0, \tan C > 0$$

$$\Rightarrow [x] = 2635 - 1 = 2634.$$

Sol.9 (D)

$$16 \cos x + 12 \sin x = \sqrt{16^2 + 12^2} \cos (x - \alpha),$$

$$\alpha = \tan^{-1} \left(\frac{3}{4} \right).$$

$$\Rightarrow |2k + 60| \leq 498 \times 20$$

$$\text{as } |\cos (x - \alpha)| \leq 1$$

$$\Rightarrow k \leq 4950.$$