EE1030: Matrix Theory

EE24BTECH11006 - Arnav Mahishi

F. Match the Following
In these questions there are entries in columns 1 and 2. Each entry in column 1 is related to exactly one entry in column 2. Write the correct letter from column 2 against the entry number in column 1 in your answer book

1. $\frac{\sin 3\alpha}{\cos 2\alpha}$ *is* [1992 – 2*Marks*]

Column I	Column II
(*A*) Positive	(*p*) $\left(\frac{13\pi}{48}, \frac{14\pi}{48}\right)$
(*B*) Negative	(*q*) $\left(\frac{14\pi}{48}, \frac{18\pi}{48}\right)$
	(*r*) $\left(\frac{18\pi}{48}, \frac{23\pi}{48}\right)$
	(*s*) $\left(0, \frac{\pi}{2}\right)$

2..Let $f(x) = \sin(\pi \cos x)$ and $g(x) = \cos(2\pi \sin x)$ be two functions defined for $x > 0$. Define the following sets whose elements are written in the increasing order. [*JEEAdv*.2019]

$X = \{x : f(x) = 0\}$,$Y = \{x : f'(x) = 0\}$
$Z = \{x : g(x) = 0\}$, $W = \{x : g'(x) = 0\}$

Column I	Column II
(*A*) X	(*p*) $\supseteq \left\{\frac{\pi}{2}, \frac{3\pi}{2}, 4\pi, 7\pi\right\}$
(*B*) Y	(*q*)an arithmetic progression
(*C*) Z	(*r*)NOT an arithmetic progression
(*D*) W	(*s*)$\supseteq \left\{\frac{\pi}{6}, \frac{7\pi}{6}, \frac{13\pi}{6}\right\}$

Which of the following is the only CORRECT combination?

a (*IV*),(*P*),(*R*),(*S*)
b (*III*),(*P*),(*Q*),(*U*)
c (*III*),(*R*),(*U*)
d (*IV*),(*Q*),(*T*)

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Paragraph 1

Let O be the origin, and $\overrightarrow{OX}, \overrightarrow{OY}, \overrightarrow{OZ}$ be three unit vectors in the directions of the sides $\overrightarrow{QR}, \overrightarrow{RP}, \overrightarrow{PQ}$ respectively, of a triangle PQR. [JEE Adv 2017]

1. $\left|\overrightarrow{OX} \times \overrightarrow{OY}\right| =$

a $\sin(P + Q)$
b $\sin 2R$
c $\sin(P + R)$
d $\sin(Q + R)$

2. If the triangle PQR varies, then the minimum value of $\cos(P + Q) + \cos(Q + R) + \cos(R + P)$ is.

a $\frac{-5}{3}$
b $\frac{-3}{2}$
c $\frac{3}{2}$
d $\frac{5}{3}$

I. Integer value type

1. The number of all possible values of θ where $0 < \theta < \pi$ for which the system of equations

1) $(y + Z)\cos 3\theta = (xyz)\sin 3\theta$

2) $x\sin 3\theta = \frac{2\cos 3\theta}{y} + \frac{2\sin 3\theta}{z}$

3) $(xyz)\sin 3\theta = (y + 2z)\cos 3\theta + y\sin 3\theta$

have a solution (x_o, y_o, x_o) with $y_o z_o \neq 0$ is (2010)

2. The number of all possible values of θ in the interval, $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ such that $\theta \neq \frac{n\pi}{5} for n = 0, \pm 1, \pm 2$ and $\tan\theta = \cot 5\theta$ as well as $\sin 2\theta = \cos 4\theta$ is [2010]

3.The maximum value of the expression $\frac{1}{\sin^2\theta + 3\sin\theta\cos\theta + 5\cos^2\theta}$ is [2010]

4. Two parallel chords of a circle of radius 2 are at a distance$\left(\sqrt{3} + 1\right)$ apart. If the chords subtend at the center, angles of $\frac{\pi}{k} and \frac{2\pi}{k}$, where $k > 0$, the value of [k] is [2010]

5. The positive integer value of $n > 3$ satisfying the equation $\frac{1}{sin\left(\frac{\pi}{n}\right)} = \frac{1}{sin\left(\frac{2\pi}{n}\right)} + \frac{1}{sin\left(\frac{3\pi}{n}\right)}$ is [2010]