# 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. $\frac{sin3\alpha}{cos2\alpha}$ *is* [$1992 - 2Marks$]

| **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 $f(x) = sin(\pi cosx)$ and $g(x) = cos(2\pi sinx)$ 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) $\supseteq \left\{\frac{\pi}{6}, \frac{7\pi}{6}, \frac{13\pi}{6}\right\}$ |
| | (t) $\supseteq \left\{\frac{\pi}{3}, \frac{2\pi}{3}, \pi\right\}$ |

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)

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

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Which of the following is the only CORRECT combination?

(a) (I),(Q),(U) (b) (I),(P),(R)
(c) (II),(R),(S) (d) (II),(Q),(T)

**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) $sin2R$
(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 $\theta$ where $0 < \theta < \pi$ for which the system of equations

$(y + Z)cos3\theta = (xyz)sin3\theta$

$xsin3\theta = \frac{2cos3\theta}{y} + \frac{2sin3\theta}{z}$

$(xyz)sin3\theta = (y + 2z)cos3\theta + ysin3\theta$

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 $\theta$ 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 $tan\theta = cot5\theta$ as well as $sin2\theta = cos4\theta$ is [2010]

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