ASSIGNMENT 1

EE24BTECH11003 - Akshara Sarma Chennubhatla

C: MCQs With One Correct Answer

20) If $\alpha + \beta = \frac{\pi}{2}$ and $\beta + \gamma = \alpha$, then $\tan\alpha$ equals $(2001S)$

(a) $2(\tan\beta + \tan\gamma)$ (b) $\tan\beta + \tan\gamma$
(c) $\tan\beta + 2\tan\gamma$ (d) $2\tan\beta + \tan\gamma$

21) The number of integral values of k for which the equation $7\cos x + 5\sin x = 2k + 1$ has a solution is $(2002S)$

(a) 4 (b) 8
(c) 10 (d) 12

22) Given both θ and ϕ are acute angles and $\sin\theta = \frac{1}{2}$, $\cos\phi = \frac{1}{3}$, then the value of $\theta + \phi$ belongs to $(2004S)$

(a) $(\frac{\pi}{3}, \frac{\pi}{2}]$ (b) $\left(\frac{\pi}{2}, \frac{2\pi}{3}\right)$
(c) $(\frac{2\pi}{3}, \frac{5\pi}{6}]$ (d) $(\frac{5\pi}{6}, \pi]$

23) $\cos(\alpha - \beta) = 1$ and $\cos(\alpha + \beta) = \frac{1}{e}$ where $\alpha, \beta \in [-\pi, \pi]$. Pairs of α, β which satisfy both the equations is/are $(2005S)$

(a) 0 (b) 1
(c) 2 (d) 4

24) The values of $\theta \in (0, 2\pi)$ for which $2\sin^2\theta - 5\sin\theta + 2 > 0$, are $(2006 - 3M, -1)$

(a) $\left(0, \frac{\pi}{6}\right) \cup \left(\frac{5\pi}{6}, 2\pi\right)$ (b) $\left(\frac{\pi}{8}, \frac{5\pi}{6}\right)$
(c) $\left(0, \frac{\pi}{8}\right) \cup \left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$ (d) $\left(\frac{41\pi}{48}, \pi\right)$

25) Let $\theta \in \left(0, \frac{\pi}{4}\right)$ and

$$t_1 = (\tan\theta)^{\tan\theta}, t_2 = (\tan\theta)^{cot\theta},$$
$$t_3 = (cot\theta)^{\tan\theta}, t_4 = (cot\theta)^{cot\theta},$$

then $(2006 - 3M, -1)$

(a) $t_1 > t_2 > t_3 > t_4$ (b) $t_4 > t_3 > t_1 > t_2$
(c) $t_3 > t_1 > t_2 > t_4$ (d) $t_2 > t_3 > t_1 > t_4$

26) The number of solutions of the pair of equations
$2\sin^2\theta - \cos 2\theta = 0$
$2\cos^2\theta - 3\sin\theta = 0$
in the interval $[0, 2\pi]$ is $(2007 - 3Marks)$

(a) zero (b) one
(c) two (d) four

27) For $x \in (0, \pi)$, the equation $\sin x + 2\sin 2x - \sin 3x = 3$ has $(JEEAdv.2014)$

(a) infinitely many solutions (b) three solutions
(c) one solution (d) no solution

28) Let $S = \left\{x \in (-\pi, \pi) : x \neq 0, \pm\frac{\pi}{2}\right\}$. The sum of all distinct solutions of the equation $\sqrt{3}\sec x + \operatorname{cosec} x + 2(\tan x - \cot x) = 0$ in the set S is equal to $(JEEAdv.2016)$

(a) $-\frac{7\pi}{9}$ (b) $-\frac{2\pi}{9}$
(c) 0 (d) $\frac{5\pi}{9}$

29) The value of

$$\sum_{k=1}^{13} \frac{1}{\sin\left(\frac{\pi}{4} + \frac{(k-1)\pi}{6}\right)\sin\left(\frac{\pi}{4} + \frac{k\pi}{6}\right)}$$

is equal to $(JEEAdv.2016)$

(a) $3 - \sqrt{3}$ (b) $2\left(3 - \sqrt{3}\right)$
(c) $2\left(\sqrt{3} - 1\right)$ (d) $2\left(2 - \sqrt{3}\right)$

D: MCQs with One or More than One Correct

1)

$$\left(1 + \cos\frac{\pi}{8}\right)\left(1 + \cos\frac{3\pi}{8}\right)\left(1 + \cos\frac{5\pi}{8}\right)\left(1 + \cos\frac{7\pi}{8}\right)$$

is equal to $(1984 - 3Marks)$

(a) $\frac{1}{2}$ (b) $\cos\frac{\pi}{8}$
(c) $\frac{1}{8}$ (d) $\frac{1+\sqrt{2}}{2\sqrt{2}}$

2) The expression

$$3\left[\sin^4\left(\frac{3\pi}{2}-\alpha\right)+\sin^4(3\pi+\alpha)\right]$$
$$-2\left[\sin^6\left(\frac{\pi}{2}+\alpha\right)+\sin^6(5\pi-\alpha)\right]$$

is equal to (1986 − 2*Marks*)

(a) 0 (b) 1
(c) 3 (d) $\sin 4\alpha+\cos 6\alpha$
(e) none of these

3) The number of all possible triplets (a_1, a_2, a_3) such that $a_1 + a_2\cos(2x) + a_3\sin^2(x) = 0$ for all x is (1987 − 2*Marks*)

(a) zero (b) one
(c) three (d) infinite
(e) none

4) The values of θ lying between $\theta = 0$ and $\theta = \frac{\pi}{2}$ and satisfying the equation

$$\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0$$

are (1988 − 2*Marks*)

(a) $\frac{7\pi}{24}$ (b) $\frac{5\pi}{24}$
(c) $\frac{11\pi}{24}$ (d) $\frac{\pi}{24}$

5) Let $2\sin^2 x + 3\sin x - 2 > 0$ and $x^2 - x - 2 < 0$ (x is measured in radians). Then x lies in the interval (1994)

(a) $\left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$ (b) $\left(-1, \frac{5\pi}{6}\right)$
(c) $(-1, 2)$ (d) $\left(\frac{\pi}{6}, 2\right)$