Q1. 21 January Shift 1

Let $\overrightarrow{\mathrm{c}}$ and $\overrightarrow{\mathrm{d}}$ be vectors such that $|\overrightarrow{\mathrm{c}}+\overrightarrow{\mathrm{d}}|=\sqrt{29}$ and $\overrightarrow{\mathrm{c}}\times(2\hat{i}+3\hat{j}+4\hat{k})=(2\hat{i}+3\hat{j}+4\hat{k})\times\overrightarrow{\mathrm{d}}$. If $\lambda_1,\lambda_2\,(\lambda_1>\lambda_2)$ are the possible values of $(\vec{c}+\vec{d})\cdot(-7\hat{i}+2\hat{j}+3\hat{k})$, then the equation

$\mathrm{K}^2x^2+\left(\mathrm{K}^2-5\,\mathrm{K}+\lambda_1\right)xy+\left(3\,\mathrm{K}+\frac{\lambda_2}{2}\right)y^2-8x+12y+\lambda_2=0$ represents a circle, for K equal to :

(1) 1 (2) 4 (3) -1 (4) 2

Q2. 21 January Shift 1

Let PQ and MN be two straight lines touching the circle $x^2+y^2-4x-6y-3=0$ at the points A and B respectively. Let O be the centre of the circle and $\angle\mathrm{AOB}=\pi/3$. Then the locus of the point of intersection of the lines PQ and MN is :

(1) $x^2+y^2-12x-18y-25=0$
(2) $3\left(x^2+y^2\right)-18x-12y+25=0$
(3) $3\left(x^2+y^2\right)-12x-18y-25=0$
(4) $x^2+y^2-18x-12y-25=0$

Q3. 21 January Shift 2

If P is a point on the circle $x^2+y^2=4$, Q is a point on the straight line $5x+y+2=0$ and $x-y+1=0$ is the perpendicular bisector of PQ, then 13 times the sum of abscissa of all such points P is _____.

Q4. 22 January Shift 1

Let the set of all values of r, for which the circles $(x+1)^2+(y+4)^2=r^2$ and $x^2+y^2-4x-2y-4=0$ intersect at two distinct points be the interval (α,β). Then $\alpha\beta$ is equal to

(1) 21 (2) 24 (3) 20 (4) 25

Q5. 23 January Shift 2

If the points of intersection of the ellipses $x^2+2y^2-6x-12y+23=0$ and $4x^2+2y^2-20x-12y+35=0$ lie on a circle of radius r and centre (a,b), then the value of $ab+18r^2$ is

(1) 52 (2) 53 (3) 51 (4) 55

Q6. 24 January Shift 1

Let $\mathrm{S}=\left\{z\in\mathbb{C}:\left|\frac{z-6i}{z-2i}\right|=1\text{ and }\left|\frac{z-8+2i}{z+2i}\right|=\frac{3}{5}\right\}$.

Then $\sum_{z\in\mathrm{s}}|z|^2$ is equal to

(1) 385 (2) 398 (3) 413 (4) 423

Q7. 24 January Shift 1

Let a circle of radius 4 pass through the origin O, the points $\mathrm{A}(-\sqrt{3}a,0)$ and $\mathrm{B}(0,-\sqrt{2}b)$, where a and b are real parameters and $ab\neq0$. Then the locus of the centroid of $\triangle OAB$ is a circle of radius

(1) $\frac{7}{3}$ (2) $\frac{8}{3}$ (3) $\frac{11}{3}$ (4) $\frac{5}{3}$

Q8. 28 January Shift 1

Let $y = x$ be the equation of a chord of the circle C_1 (in the closed half-plane $x \geq 0$) of diameter 10 passing through the origin. Let C_2 be another circle described on the given chord as its diameter. If the equation of the chord of the circle C_2, which passes through the point $(2, 3)$ and is farthest from the center of C_2, is $x + ay + b = 0$, then $a - b$ is equal to

(1) -2 (2) 10 (3) -6 (4) 6

Q9. 28 January Shift 2

Let the circle $x^2 + y^2 = 4$ intersect x-axis at the points $\mathrm{A}(\mathrm{a}, 0)$, $\mathrm{a} > 0$ and $\mathrm{B}(\mathrm{b}, 0)$. Let $\mathrm{P}(2\cos\alpha, 2\sin\alpha)$, $0 < \alpha < \frac{\pi}{2}$ and $\mathrm{Q}(2\cos\beta, 2\sin\beta)$ be two points such that $(\alpha - \beta) = \frac{\pi}{2}$. Then the point of intersection of AQ and BP lies on :

(1) $x^2 + y^2 - 4y - 4 = 0$
(2) $x^2 + y^2 - 4x - 4y = 0$
(3) $x^2 + y^2 - 4x - 4 = 0$
(4) $x^2 + y^2 - 4x - 4y - 4 = 0$

ANSWER KEYS

1. (1) **2.** (3) **3.** 2 **4.** (4) **5.** (4) **6.** (1) **7.** (2) **8.** (1)
9. (1)