## Section (A) : Equation of circle, parametric equation, position of a point

**A-1.** The radius of the circle passing through the points (1, 2), (5, 2) & (5, – 2) is: **[15JM110320]**

(A) $5\sqrt{2}$ (B) $2\sqrt{5}$ (C) $3\sqrt{2}$ (D) $2\sqrt{2}$

**A-2.** The centres of the circles $x^2 + y^2 - 6x - 8y - 7 = 0$ and $x^2 + y^2 - 4x - 10y - 3 = 0$ are the ends of the diameter of the circle **[16JM110499]**

(A) $x^2 + y^2 - 5x - 9y + 26 = 0$
(B) $x^2 + y^2 + 5x - 9y + 14 = 0$
(C) $x^2 + y^2 + 5x - y - 14 = 0$
(D) $x^2 + y^2 + 5x + y + 14 = 0$

**A-3.** The circle described on the line joining the points (0, 1), (a, b) as diameter cuts the x-axis in points whose abscissa are roots of the equation: **[15JM110321]**

(A) $x^2 + ax + b = 0$ (B) $x^2 - ax + b = 0$ (C) $x^2 + ax - b = 0$ (D) $x^2 - ax - b = 0$

**A-4.** The intercepts made by the circle $x^2 + y^2 - 5x - 13y - 14 = 0$ on the x-axis and y-axis are respectively

(A) 9, 13 (B) 5, 13 (C) 9, 15 (D) none **[16JM110500]**

**A-5.** Equation of line passing through mid point of intercepts made by circle $x^2 + y^2 - 4x - 6y = 0$ on co-ordinate axes is **[15JM110322]**

(A) $3x + 2y - 12 = 0$ (B) $3x + y - 6 = 0$ (C) $3x + 4y - 12 = 0$ (D) $3x + 2y - 6 = 0$

**A-6.** Two thin rods AB & CD of lengths 2a & 2b move along OX & OY respectively, when 'O' is the origin. The equation of the locus of the centre of the circle passing through the extremities of the two rods is: **[15JM110347]**

(A) $x^2 + y^2 = a^2 + b^2$ (B) $x^2 - y^2 = a^2 - b^2$ (C) $x^2 + y^2 = a^2 - b^2$ (D) $x^2 - y^2 = a^2 + b^2$

**A-7.** Let A and B be two fixed points then the locus of a point C which moves so that $(\tan\angle BAC)(\tan\angle ABC)=1$, $0 < \angle BAC < \frac{\pi}{2}, 0 < \angle ABC < \frac{\pi}{2}$ is

(A) Circle (B) pair of straight line (C) A point (D) Straight line

**A-8.** **STATEMENT-1 :** The length of intercept made by the circle $x^2 + y^2 - 2x - 2y = 0$ on the x-axis is 2.

**STATEMENT-2 :** $x^2 + y^2 - \alpha x - \beta y = 0$ is a circle which passes through origin with centre $\left(\frac{\alpha}{2}, \frac{\beta}{2}\right)$ and radius $\sqrt{\frac{\alpha^2 + \beta^2}{2}}$.



(A) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is correct explanation for STATEMENT-1
(B) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is not correct explanation for STATEMENT-1
(C) STATEMENT-1 is true, STATEMENT-2 is false
(D) STATEMENT-1 is false, STATEMENT-2 is true

## Section (B) : Line and circle, tangent, pair of tangent

**B-1.** Find the co-ordinates of a point p on line $x + y = -13$, nearest to the circle $x^2 + y^2 + 4x + 6y - 5 = 0$

(A) (– 6, – 7) (B) (– 15, 2) (C) (– 5, – 6) (D) (– 7, – 6) **[15JM110324]**

**B-2.** The number of tangents that can be drawn from the point (8, 6) to the circle $x^2 + y^2 - 100 = 0$ is

(A) 0 (B) 1 (C) 2 (D) none **[15JM110325]**

**B-3.** Two lines through (2, 3) from which the circle $x^2 + y^2 = 25$ intercepts chords of length 8 units have equations

(A) $2x + 3y = 13$, $x + 5y = 17$
(B) $y = 3$, $12x + 5y = 39$
(C) $x = 2$, $9x - 11y = 51$
(D) $y = 0$, $12x + 5y = 39$

**B-4.** The line $3x + 5y + 9 = 0$ w.r.t. the circle $x^2 + y^2 - 4x + 6y + 5 = 0$ is [16JM110501]
(A) chord dividing circumference in 1 : 3 ratio (B) diameter
(C) tangent (D) outside line

**B-5.** If one of the diameters of the circle $x^2 + y^2 - 2x - 6y + 6 = 0$ is a chord to the circle with centre (2, 1), then the radius of the circle is [15JM110333]
(A) 3 (B) 2 (C) 3/2 (D) 1

**B-6.** The tangent lines to the circle $x^2 + y^2 - 6x + 4y = 12$ which are parallel to the line $4x + 3y + 5 = 0$ are given by: [16JM110502]
(A) $4x + 3y - 7 = 0,\ 4x + 3y + 15 = 0$ (B) $4x + 3y - 31 = 0,\ 4x + 3y + 19 = 0$
(C) $4x + 3y - 17 = 0,\ 4x + 3y + 13 = 0$ (D) $4x + 3y - 31 = 0,\ 4x + 3y - 19 = 0$

**B-7.** The condition so that the line $(x + g)\cos\theta + (y + f)\sin\theta = k$ is a tangent to $x^2 + y^2 + 2gx + 2fy + c = 0$ is [15JM110327]
(A) $g^2 + f^2 = c + k^2$ (B) $g^2 + f^2 = c^2 + k$ (C) $g^2 + f^2 = c^2 + k^2$ (D) $g^2 + f^2 = c + k$

**B-8.** The tangent to the circle $x^2 + y^2 = 5$ at the point (1, –2) also touches the circle $x^2 + y^2 - 8x + 6y + 20 = 0$ at [15JM110328]
(A) (–2, 1) (B) (–3, 0) (C) (–1, –1) (D) (3, –1)

**B-9.** The angle between the two tangents from the origin to the circle $(x - 7)^2 + (y + 1)^2 = 25$ equals

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{2}$ (D) $\frac{\pi}{6}$



**B-10.** A point A(2, 1) is outside the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ & AP, AQ are tangents to the circle. The equation of the circle circumscribing the triangle APQ is : [16JM110503]
(A) $(x + g)(x - 2) + (y + f)(y - 1) = 0$ (B) $(x + g)(x - 2) - (y + f)(y - 1) = 0$
(C) $(x - g)(x + 2) + (y - f)(y + 1) = 0$ (D) $(x - g)(x - 2) + (y - f)(y - 1) = 0$

**B-11.** A line segment through a point P cuts a given circle in 2 points A & B, such that PA = 16 & PB = 9, find the length of tangent from points to the circle
(A) 7 (B) 25 (C) 12 (D) 8

**B-12.** The length of the tangent drawn from any point on the circle $x^2 + y^2 + 2gx + 2fy + p = 0$ to the circle $x^2 + y^2 + 2gx + 2fy + q = 0$ is: [16JM110504]
(A) $\sqrt{q - p}$ (B) $\sqrt{p - q}$ (C) $\sqrt{q + p}$ (D) $\sqrt{2q + p}$

**B-13.** The equation of the diameter of the circle $(x - 2)^2 + (y + 1)^2 = 16$ which bisects the chord cut off by the circle on the line $x - 2y - 3 = 0$ is
(A) $x + 2y = 0$ (B) $2x + y - 3 = 0$ (C) $3x + 2y - 4 = 0$ (D) $3x - 2y - 4 = 0$

**B-14.** The locus of the point of intersection of the tangents to the circle $x^2 + y^2 = a^2$ at points whose parametric angles differ by $\frac{\pi}{3}$ is [16JM110505]

(A) $x^2 + y^2 = \frac{4a^2}{3}$ (B) $x^2 + y^2 = \frac{2a^2}{3}$ (C) $x^2 + y^2 = \frac{a^2}{3}$ (D) $x^2 + y^2 = \frac{a^2}{9}$

## Section (C) : Normal, Director circle, chord of contact, chord with mid point

C-1. The equation of normal to the circle $x^2 + y^2 - 4x + 4y - 17 = 0$ which passes through (1, 1) is
(A) $3x + y - 4 = 0$ (B) $x - y = 0$ (C) $x + y = 0$ (D) $3x - y - 4 = 0$

C-2. The normal at the point (3, 4) on a circle cuts the circle at the point (–1, –2). Then the equation of the circle is **[15JM110331]**
(A) $x^2 + y^2 + 2x - 2y - 13 = 0$ (B) $x^2 + y^2 - 2x - 2y - 11 = 0$
(C) $x^2 + y^2 - 2x + 2y + 12 = 0$ (D) $x^2 + y^2 - 2x - 2y + 14 = 0$

C-3. The co-ordinates of the middle point of the chord cut off on $2x - 5y + 18 = 0$ by the circle $x^2 + y^2 - 6x + 2y - 54 = 0$ are
(A) (1, 4) (B) (2, 4) (C) (4, 1) (D) (1, 1)

C-4. The locus of the mid point of a chord of the circle $x^2 + y^2 = 4$ which subtends a right angle at the origin is: **[15JM110332]**
(A) $x + y = 2$ (B) $x^2 + y^2 = 1$ (C) $x^2 + y^2 = 2$ (D) $x + y = 1$

C-5. The chords of contact of the pair of tangents drawn from each point on the line $2x + y = 4$ to the circle $x^2 + y^2 = 1$ pass through the point
(A) (1, 2) (B) $\left(\frac{1}{2}, \frac{1}{4}\right)$ (C) (2, 4) (D) (4, 4)



C-6. The locus of the centers of the circles such that the point (2, 3) is the mid point of the chord $5x + 2y = 16$ is: **[16JM110506]**
(A) $2x - 5y + 11 = 0$ (B) $2x + 5y - 11 = 0$ (C) $2x + 5y + 11 = 0$ (D) $2x - 5y - 11 = 0$

C-7. Find the locus of the mid point of the chord of a circle $x^2 + y^2 = 4$ such that the segment intercepted by the chord on the curve $x^2 - 2x - 2y = 0$ subtends a right angle at the origin.
(A) $x^2 + y^2 - 2x - 2y = 0$ (B) $x^2 + y^2 + 2x - 2y = 0$
(C) $x^2 + y^2 + 2x + 2y = 0$ (D) $x^2 + y^2 - 2x + 2y = 0$

## Section (D) : Position of two circle, Orthogonality, Radical axis and radical centre

D-1. Number of common tangents of the circles $(x + 2)^2+(y-2)^2 = 49$ and $(x - 2)^2 + (y + 1)^2 = 4$ is:
(A) 0 (B) 1 (C) 2 (D) 3 **[15JM110334]**

D-2. The equation of the common tangent to the circle $x^2 + y^2 - 4x - 6y - 12 = 0$ and $x^2 + y^2 + 6x + 18y + 26 = 0$ at their point of contact is **[16JM110507]**
(A) $12x + 5y + 19 = 0$ (B) $5x + 12y + 19 = 0$
(C) $5x - 12y + 19 = 0$ (D) $12x - 5y + 19 = 0$

D-3. Equation of the circle cutting orthogonally the three circles $x^2 + y^2 - 2x + 3y - 7 = 0$, $x^2 + y^2 + 5x - 5y + 9 = 0$ and $x^2 + y^2 + 7x - 9y + 29 = 0$ is
(A) $x^2 + y^2 - 16x - 18y - 4 = 0$ (B) $x^2 + y^2 - 7x + 11y + 6 = 0$
(C) $x^2 + y^2 + 2x - 8y + 9 = 0$ (D) $x^2 + y^2 + 16x - 18y - 4 = 0$

D-4. If the length of a common internal tangent to two circles is 7, and that of a common external tangent is 11, then the product of the radii of the two circles is: **[16JM110508]**
(A) 18 (B) 20 (C) 16 (D) 12

## Section (E) : Family of circles , Locus, Miscellaneous

**E-1.** The locus of the centre of the circle which bisects the circumferences of the circles $x^2 + y^2 = 4$ & $x^2 + y^2 - 2x + 6y + 1 = 0$ is:

(A) a straight line (B) a circle (C) a parabola (D) pair of straight line

**E-2_.** Find the equation of the circle which passes through the point (1, 1) & which touches the cir $x^2 + y^2 + 4x - 6y - 3 = 0$ at the point (2, 3) on it. [16JM1105

(A) $x^2 + y^2 + x - 6y + 3 = 0$ (B) $x^2 + y^2 + x - 6y - 3 = 0$

(C) $x^2 + y^2 + x + 6y + 3 = 0$ (D) $x^2 + y^2 + x - 3y + 3 = 0$

**E-3.** Find the equation of circle touching the line $2x + 3y + 1 = 0$ at $(1, -1)$ and cutting orthogonally th circle having line segment joining (0, 3) and $(-2, -1)$ as diameter.

(A) $2x^2 + 2y^2 - 10x - 5y + 1 = 0$ (B) $2x^2 + 2y^2 - 10x + 5y + 1 = 0$

(C) $2x^2 + 2y^2 - 10x - 5y - 1 = 0$ (D) $2x^2 + 2y^2 + 10x - 5y + 1 = 0$

## PART - III : MATCH THE COLUMN

**1.**

| Column – I | | Column – II | |
|---|---|---|---|
| (A) | Number of values of a for which the common chord of the circles $x^2 + y^2 = 8$ and $(x - a)^2 + y^2 = 8$ subtends a right angle at the origin is | (p) | 4 |
| (B) | A chord of the circle $(x - 1)^2 + y^2 = 4$ lies along the line $y = 22\sqrt{3}(x - 1)$. The length of the chord is equal to | (q) | 2 |
| (C) | The number of circles touching all the three lines $3x + 7y = 2$, $21x + 49y = 5$ and $9x + 21y = 0$ are | (r) | 0 |
| (D) | If radii of the smallest and largest circle passing through the point $(\sqrt{3}, \sqrt{2})$ and touching the circle $x^2 + y^2 - 2\sqrt{2}y - 2 = 0$ are $r_1$ and $r_2$ respectively, then the mean of $r_1$ and $r_2$ is | (s) | 1 |

**2.** [16JM11051

| Column – I | | Column – II | |
|---|---|---|---|
| (A) | Number of common tangents of the circles $x^2 + y^2 - 2x = 0$ and $x^2 + y^2 + 6x - 6y + 2 = 0$ is | (p) | 1 |
| (B) | Number of indirect common tangents of the circles $x^2 + y^2 - 4x - 10y + 4 = 0$ & $x^2 + y^2 - 6x - 12y - 55 = 0$ is | (q) | 2 |
| (C) | Number of common tangents of the circles $x^2 + y^2 - 2x - 4y = 0$ & $x^2 + y^2 - 8y - 4 = 0$ is | (r) | 3 |
| (D) | Number of direct common tangents of the circles $x^2 + y^2 + 2x - 8y + 13 = 0$ & $x^2 + y^2 - 6x - 2y + 6 = 0$ is | (s) | 0 |