

## SYSTEM OF CIRCLES

### PREVIOUS EAMCET BITS

1. The point  $(3, -4)$  lies on both the circle  $x^2 + y^2 - 2x + 8y + 13 = 0$  and  $x^2 + y^2 - 4x + 6y + 11 = 0$ . Then the angle between the circles is [EAMCET 2009]

- 1)  $60^\circ$                       2)  $\tan^{-1}\left(\frac{1}{2}\right)$                       3)  $\tan^{-1}\left(\frac{3}{5}\right)$                       4)  $135^\circ$

Ans: 4

Sol.  $\cos \theta = \frac{d^2 - r_1^2 - r_2^2}{2r_1r_2}$

$r_1 = 2, r_2 = \sqrt{2}, d = \sqrt{2}$

$\Rightarrow \theta = 135^\circ$

2. The equation of the circle which passes through the origin and cuts orthogonally each of the circle  $x^2 + y^2 - 6x + 8 = 0$  and  $x^2 + y^2 - 2x - 2y = 7$  is [EAMCET 2009]

- 1)  $3x^2 + 3y^2 - 8x - 13y = 0$                       2)  $3x^2 + 3y^2 - 8x - 29y = 0$   
 3)  $3x^2 + 3y^2 + 8x + 29y = 0$                       4)  $3x^2 + 3y^2 - 8x - 29y = 0$

Ans: 2

Sol. Find the radical axis and centre of required circle lies on radical axis.

3. The condition for the coaxial system  $x^2 + y^2 + 2\lambda x + c = 0$ , where  $\lambda$  is a parameter and  $c$  is a constant, to have distinct limiting points is [EAMCET 2007]

- 1)  $c = 0$                       2)  $c < 0$                       3)  $c = -1$                       4)  $c > 0$

Ans: 4

Sol. Limiting points are  $(\pm\sqrt{c}, 0) \Rightarrow c > 0$

4. The number of common tangent to the two circles  $x^2 + y^2 - 8x + 2y = 0$  and  $x^2 + y^2 - 2x - 16y + 25 = 0$  is [EAMCET 2006]

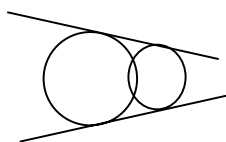
- 1) 1                      2) 2                      3) 3                      4) 4

Ans: 2

Sol.  $r_1 = \sqrt{17}, r_2 = \sqrt{40}$

$c_1c_2 = \sqrt{90}$

$|r_1 - r_2| < c_1c_2 < r_1 + r_2$



Two circle intersect each other

$\therefore$  Number of common tangents = 2

5. The equation of the circle whose diameter is the common chord of the circles [EAMCET 2005]

$x^2 + y^2 + 2x + 3y + 2 = 0$  and  $x^2 + y^2 + 2x - 3y - 4 = 0$  is

1)  $x^2 + y^2 + 2x + 2y + 2 = 0$

2)  $x^2 + y^2 + 2x + 2y - 1 = 0$

3)  $x^2 + y^2 + 2x + 2y + 1 = 0$

4)  $x^2 + y^2 + 2x + 2y + 3 = 0$

Ans: 3

Sol.  $L = S - S' \equiv y + 1 = 0$

Equation of circle is  $S + \lambda L = 0$

Whose centre lies on the line  $L \equiv O$

$\therefore -\frac{(3-\lambda)}{2} + 1 = 0 \Rightarrow \lambda = -1$

$\therefore$  Equation of circle is  $x^2 + y^2 + 2x + 2y + 1 = 0$

6. A line  $\ell$  meets the circle  $x^2 + y^2 = 61$  in A, B and  $P(-5, 6)$  is such that  $PA = PB = 10$ . Then the equation of  $\ell$  is [EAMCET 2004]

1)  $5x + 6y + 11 = 0$     2)  $5x - 6y - 11 = 0$     3)  $5x - 6y + 11 = 0$     4)  $5x - 6y + 12 = 0$

Ans: 3

Sol.  $S = x^2 + y^2 - 61 = 0$

$S' = (x + 5)^2 + (y - 6)^2 = 100$

$L = S - S' = 0$

7. If the circle  $x^2 + y^2 + 6x - 2y + k = 0$  bisects the circumference of the  $x^2 + y^2 + 2x - 6y - 15 = 0$  then  $k = \dots\dots$  [EAMCET 2003]

1) 21                      2) -21                      3) 23                      4) -23

Ans: 4

Sol.  $S = x^2 + y^2 + 6x - 2y + k = 0$

$S' = x^2 + y^2 + 2x - 6y + 15 = 0$

common chord of  $S = 0$   $S' = 0$  is  $S - S' = 0$

$\Rightarrow 4x + 4y + k - 15 = 0 \rightarrow (1)$

Centre of  $S' = 0$  is  $(-1, 3)$  lies on (1)

$k = -23$

8. The limiting points of the coaxial system containing the two circles  $x^2 + y^2 + 2x - 2y + 2 = 0$  and  $25(x^2 + y^2) - 10x - 80y + 65 = 0$  are [EAMCET 2001]

1)  $(1, 1) (-5, -40)$     2)  $(1, -1) \left[ \frac{-1}{5}, \frac{-8}{5} \right]$     3)  $(-1, 1) \left[ \frac{1}{5}, \frac{8}{5} \right]$     4)  $(-1, 1) \left[ \frac{-1}{5}, \frac{-8}{5} \right]$

Ans: 3

Sol. The radius of the circle  $x^2 + y^2 + 2x - 2y + 2 = 0$  is zero

Its centre is one limiting point i.e.  $(-1, 1)$

Radical axis is  $4x + 2y - 1 = 0$

The other limiting point is image of  $(-1, 1)$  w.r.t the radical axis

$\therefore$  The other limiting point is  $\left(\frac{1}{5}, \frac{8}{5}\right)$ .

9. The radical axis of the circles  $x^2 + y^2 + 3x + 4y - 5 = 0$  and  $x^2 + y^2 - 5x + 5y - 6 = 0$  is

[EAMCET 2001]

- 1)  $8y - x + 1 = 0$     2)  $8x - y + 1 = 0$     3)  $8x - 8y + 1 = 0$     4)  $y - 8x + 1 = 0$

Ans: 2

Sol. R.A is  $S - S' = 0 \Rightarrow 8x - y + 1 = 0$

10. Two circles of equal radius 'r' cut orthogonally. If their centres are  $(2, 3)$  and  $(5, 6)$ , then  $r =$

[EAMCET 2000]

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

Ans: 3

Sol.  $d^2 = r_1^2 + r_2^2 \Rightarrow 9 + 9 = r^2 + r^2 \Rightarrow r = 3$

11. If  $(1, 2)$  is a limiting point of a coaxial system of circles containing the circle  $x^2 + y^2 + x - 5y + 9 = 0$ , then the equation of radical axis is

[EAMCET 2009]

- 1)  $x + 3y + 9 = 0$     2)  $3x - y + 4 = 0$     3)  $x + 9y - 4 = 0$     4)  $3x - y - 1 = 0$

Ans: 2

Sol. The equation of the limiting point circle is  $S = (x-1)^2 + (y-2)^2 = 0$

Equation of the given circle is  $S' = x^2 + y^2 + x - 5y + 9 = 0$

$\therefore$  equation of the radical axis is  $S - S' = 0 \Rightarrow 3x - y + 4 = 0$

