$Otherwise, P(x_1, y_1)$ *will be situated in the opposite side of the line* $ax + by + c = 0$ *in which the origin* $(0,0)$ *exists.*

(14) *The* $\perp$ *distance from the external point* $P(x_1, y_1)$ *to the line* $ax + by + c = 0$ *is* $\dfrac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$.

(15) *The equation of bisectors of angles between two given straight lines* $a_1x + b_1y + c_1 = 0$ & $a_2x + b_2y + c_2 = 0$ *are*

$$\frac{a_1x + b_1y + c_1}{\sqrt{{a_1}^2 + {b_1}^2}} = \pm \frac{a_2x + b_2y + c_2}{\sqrt{{a_2}^2 + {b_2}^2}}$$

If c_1 & c_2 *have same sign, then* $(+ve)$ *sign is taken, otherwise* $(-ve)$ *sign is taken.*

(16) *The distance between two* $\parallel$ *lines is* $\frac{|c-k|}{\sqrt{a^2+b^2}}$.

Circle

(1) **Forms of Circle:-**

(i) $x^2 + y^2 = a^2$; *centre* $\rightarrow (0,0)$, *radius* $\rightarrow a$

(ii) *Parametric equation*: $x = a\cos\theta$; $y = a\sin\theta$

(iii) *Centre – radius form*: $(x - \alpha)^2 + (y - \beta)^2 = a^2$; *centre* $\rightarrow (\alpha, \beta)$, *radius* $\rightarrow a$

(iv) *General form*: $x^2 + y^2 + 2gx + 2fy + c = 0$; *centre* $\rightarrow (-g, -f)$,

radius $\rightarrow \sqrt{g^2 + f^2 - c}$, $x -$ *intercept* $\rightarrow 2\sqrt{g^2 - c}$, $y -$ *intercept* $\rightarrow 2\sqrt{f^2 - c}$.

If $c = 0$, *the circle passes through the origin*;

if $f = 0$, *its centre lies on the* $X -$ *axis*, *if* $g = 0$, *its centre lies on the* $Y -$ *axis.*

(2) *Equation of the circle with the join of two points* (x_1, y_1) & (x_2, y_2) *as diameter is*

$$(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$$

(3) *Any point on the circle* $x^2 + y^2 = a^2$ *is* $(a\cos\theta, b\sin\theta)$.

(4) *The equation of the concentric circle with the circle* $x^2 + y^2 + 2gx + 2fy + c = 0$ *is*

$$x^2 + y^2 + 2gx + 2fy + c' = 0$$

(5) *Let's consider two circles* – – – – – –

$x^2 + y^2 + 2g_1x + 2f_1y + c_1 = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)$

$x^2 + y^2 + 2g_2x + 2f_2y + c_2 = 0 \ldots\ldots\ldots\ldots\ldots\ldots .. (ii)$

(i) *The equation of the circle passes through the intersecting points of* (i) & (ii) *is*
$x^2 + y^2 + 2g_1x + 2f_1y + c_1 + k(x^2 + y^2 + 2g_2x + 2f_2y + c_2) = 0 \quad [k \neq -1]$

(ii) *The equation of the common chord of* (i) & (ii) *is*
$2(g_1 - g_2)x + 2(f_1 - f_2)y + (c_1 - c_2) = 0$

(iii) *The condition that the two circle* (i) & (ii) *will cut orthogonally is*
$2g_1g_2 + 2f_1f_2 = c_1 + c_2$