MOHR'S CIRCLE CONCLUSIONS

1. Every plane passing through a point under bi-ax state of stress is represented by a radial line in the Mohr's circle.
2. X & Y coordinates of any point on the circle represent normal and shear stress on the corresponding oblique plane passing through that point, respectively.
3. Every plane passing through a point is represented in the Mohr's circle by double its actual angle (i.e. 2θ)
4. Centre of Mohr's circle always lies on x-axis & its coordinates are $\left[\frac{\sigma_1+\sigma_2}{2}, 0\right]$
5. Principal planes are represented by the radial lines lying on x-axis.
6. Principal stresses are equal to the x-coordinates of points of intersection of circle with the x-axis.
7. Maximum shear stress planes are represented by the radial lines which are parallel to Y-axis.
8. Normal stress on max. shear stress plane [i.e. σ_n^*] is equal to x-coordinate of centre of Mohr's circle.
9. In-plane τ_{max} is equal to radius of Mohr's circle.
i.e. In-plane τ_{max} = Radius $= \pm\left(\frac{\sigma_1-\sigma_2}{2}\right) = \pm\frac{1}{2}\sqrt{(\sigma_x-\sigma_y)^2+4\tau_{xy}^2}$
10. Planes of pure shear are represented by the radial lines which are passing through the points where circle intersects Y-axis.
11. Shear stress on planes of pure shear (i.e. τ_s^*), is equal to the Y coordinate of points of intersection of circle with Y-axis. (or) $\tau_s^* = \sqrt{-\sigma_1\sigma_2}$
12. Planes of pure shear are possible when Mohr's circle intersects Y-axis [i.e. when $\sigma_{1,2}$ are unlike in nature]

13. Resultant shear stress on any oblique plane is equal to length of the line which is joining the corresponding point on the circle with the origin.

14. Mohr's circle becomes tangential to Y-axis for uni-axial state of stress but never circle will be tangential to x-axis.

15. Reference plane may lie on x-axis (or) on Y-axis (or) in in any one of the quadrant.

16. If Mohr's circle is given, stresses on principal planes, Max-shear stress planes & planes of pure shear can be determined but plane location can't be determined.

17. If Mohr's circle intersects Y-axis then,
(i) principal stresses are unlike in nature. Hence, they are known as maximum tensile stress and maximum compressive stress.
(ii) planes of pure shear will exist.
(iii) In-plane τ_{max} = Abs. τ_{max} = Radius of Mohr's circle.

18. centre of Mohr's circle coincides with the origin under following conditions:-
(i) $\sigma_x = -\sigma_y$ and $\tau_{xy} = 0$ (ii) $\sigma_x = -\sigma_y$ and $\tau_{xy} \neq 0$
(iii) $\sigma_x = \sigma_y = 0$ and $\tau_{xy} = \tau$.

19. When centre of Mohr's circle with origin then,
(i) principal stresses are equal & unlike in nature. (i.e $\sigma_1/\sigma_2 = -1$)
(ii) planes of pure shear and maximum shear stress planes coincides with each other.
(iii) $(\sigma_{max})_{tensile} = (\sigma_{max})_{comp} =$ In-plane τ_{max} = Abs. τ_{max} = τ_s^* = Resultant stress on any o.p = Radius of circle.

20. Mohr's circle becomes a point on x-axis when $\sigma_x = \sigma_y$ & $\tau_{xy} = 0$. eg:- Thin spherical pressure vessel under Internal pressure [i.e $\sigma_x = \sigma_y = \sigma_h = PD/4t$ & $\tau_{xy} = 0$]