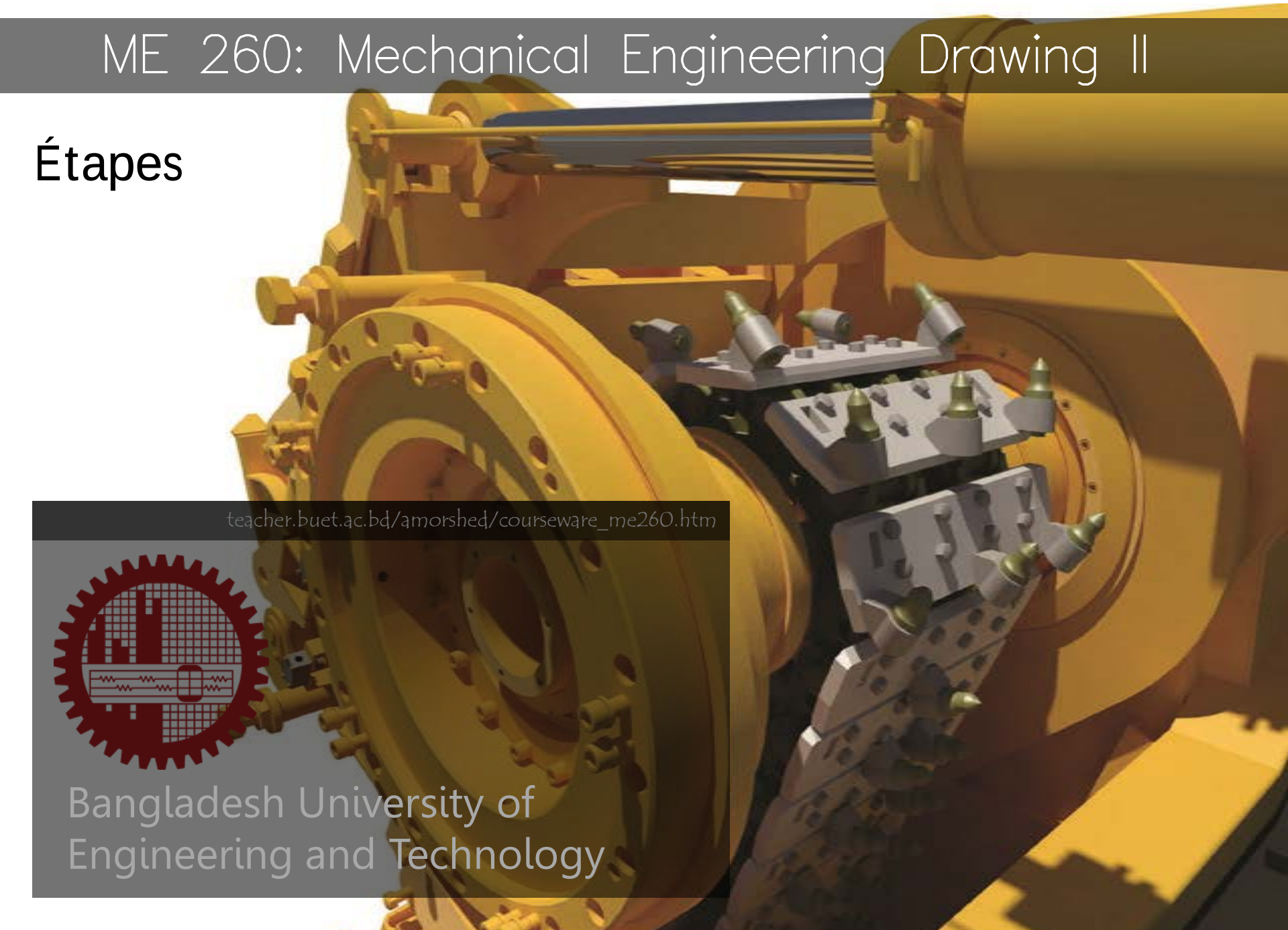
ME 260: Mechanical Engineering Drawing II

Étapes



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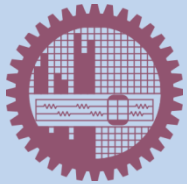
Bangladesh University of Engineering and Technology

Problem: Draw detailed, simplified and sectional views of a spur gear of following specifications:

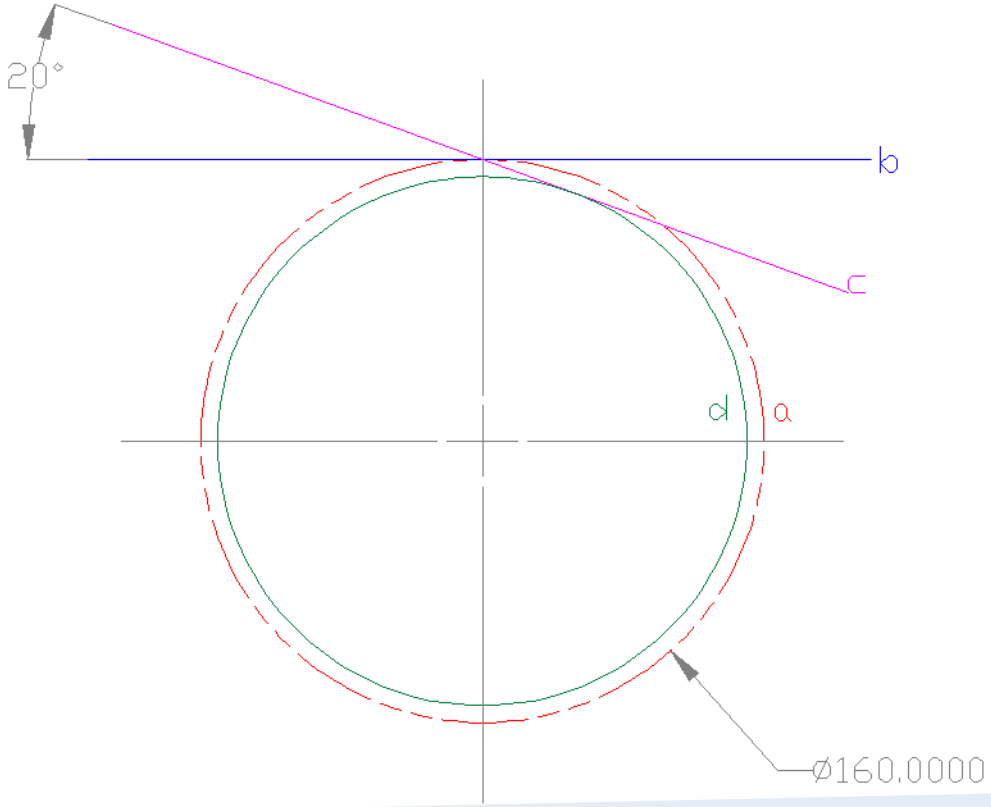
- Pitch circle diameter = 160
- Number of teeth = 20
- Module = 8
- Pressure Angle = 20°
- Face/rim width = 80
- Inside diameter of hub = 25
- Outside diameter of hub = 50
- Hub length = 90
- Inside diameter of rim = 118
- Web thickness = 12

There is web in between the rim and hub and it is placed symmetrically with respect to the rim and hub widths. Fillets and rounds are 3. There is a keyway of width 6 and depth 3 to fix a shaft. Material is gray cast iron (ASTM 30).



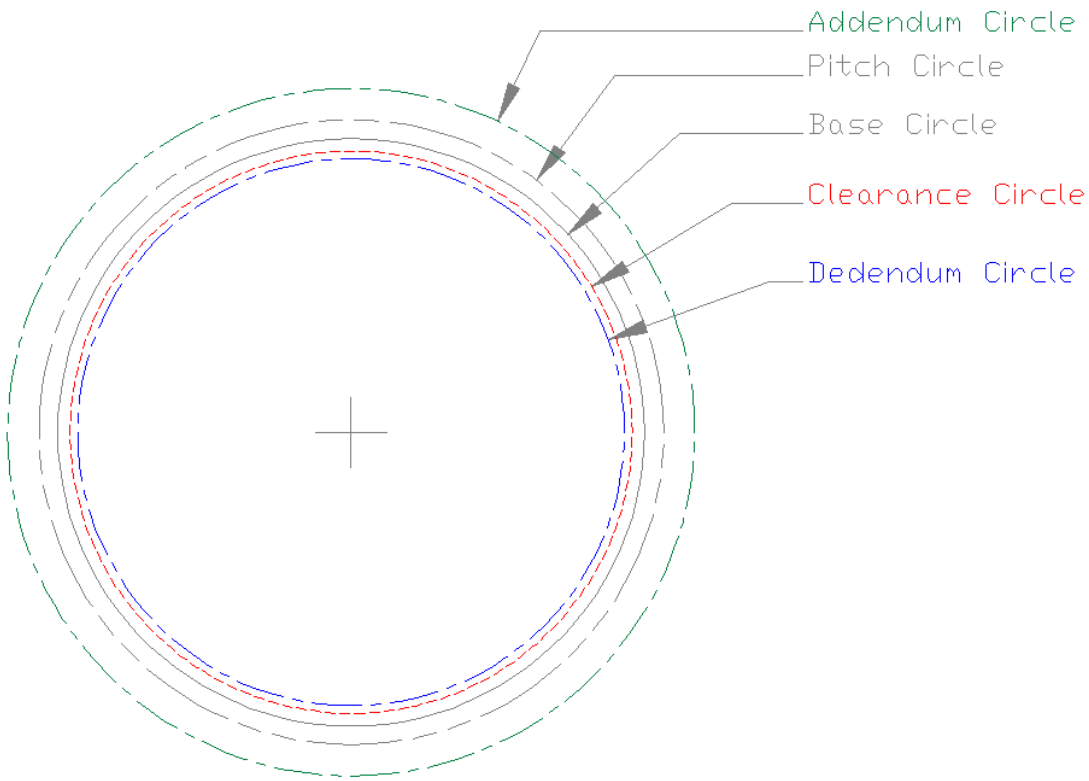
Step 1: Base and Pitch

a. Draw pitch circle (ϕ = 160 mm); Put centre line.
b. Draw a horizontal tangent at the upper periphery.
c. Draw a straight line at an angle of 20° (pressure angle) through the tangent point from (b).
d. Draw a circle tangent to the line in (c) from the centre of the pitch circle. This is the base circle.



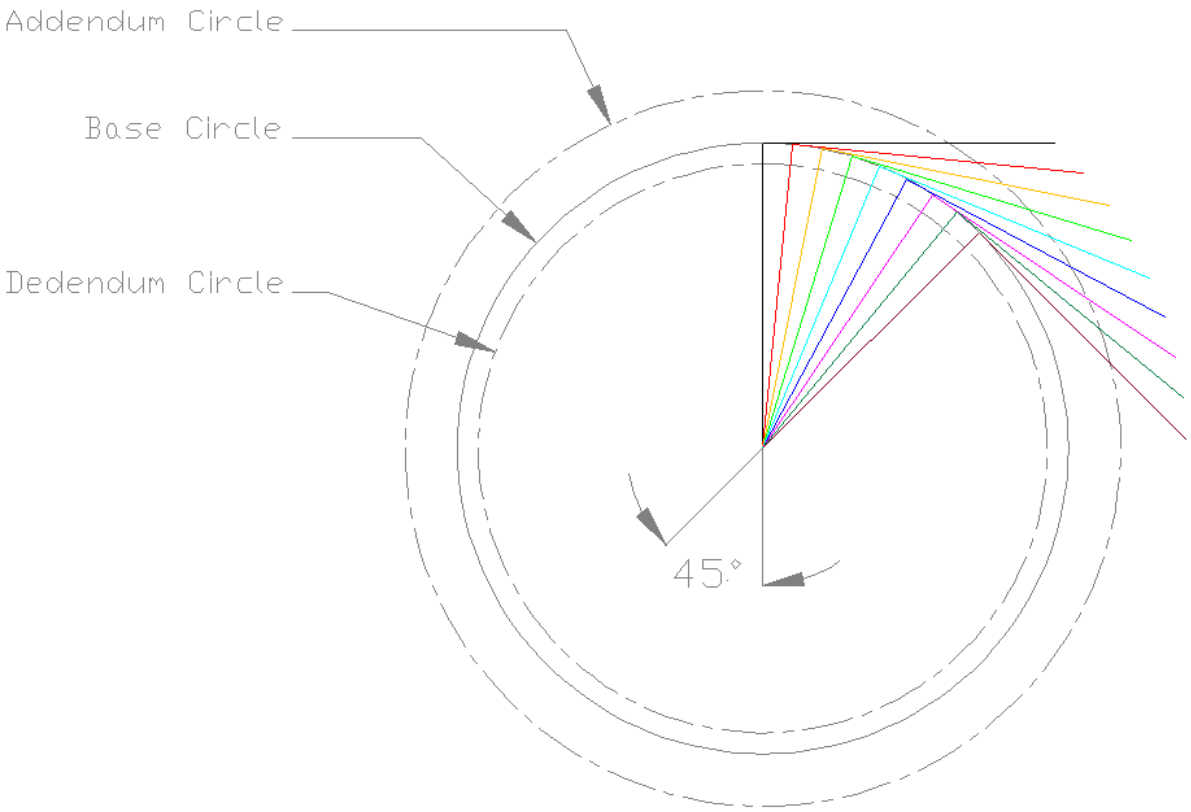
Step 2: Addendum, Dedendum and Clearance

a. Draw Addendum circle (r_a = 80 + m = 88 mm); a = m
b. Draw Dedendum circle (r_b = 80 - 1.25m = 70 mm); b = 1.25m
c. Draw Clearance circle (r_c = 72 mm); c = b - a



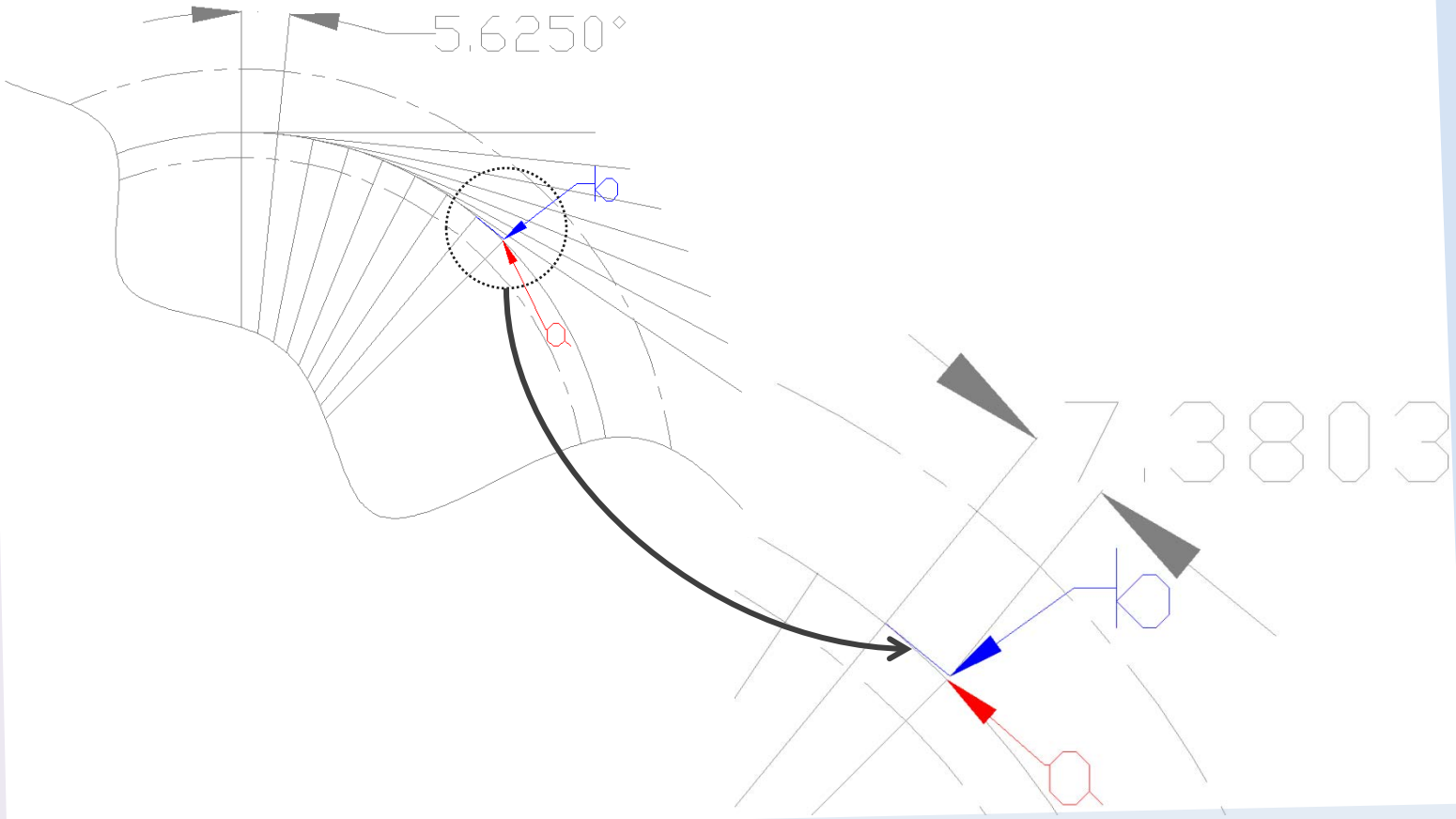
Step 3: Involute - Sectors

a. Draw a vertical line from centre and a tangent at its intersection with base circle.
b. Take a 45° sector and divide it in 8 (arbitrary) equal parts using polar array with the vertical and tangent line.



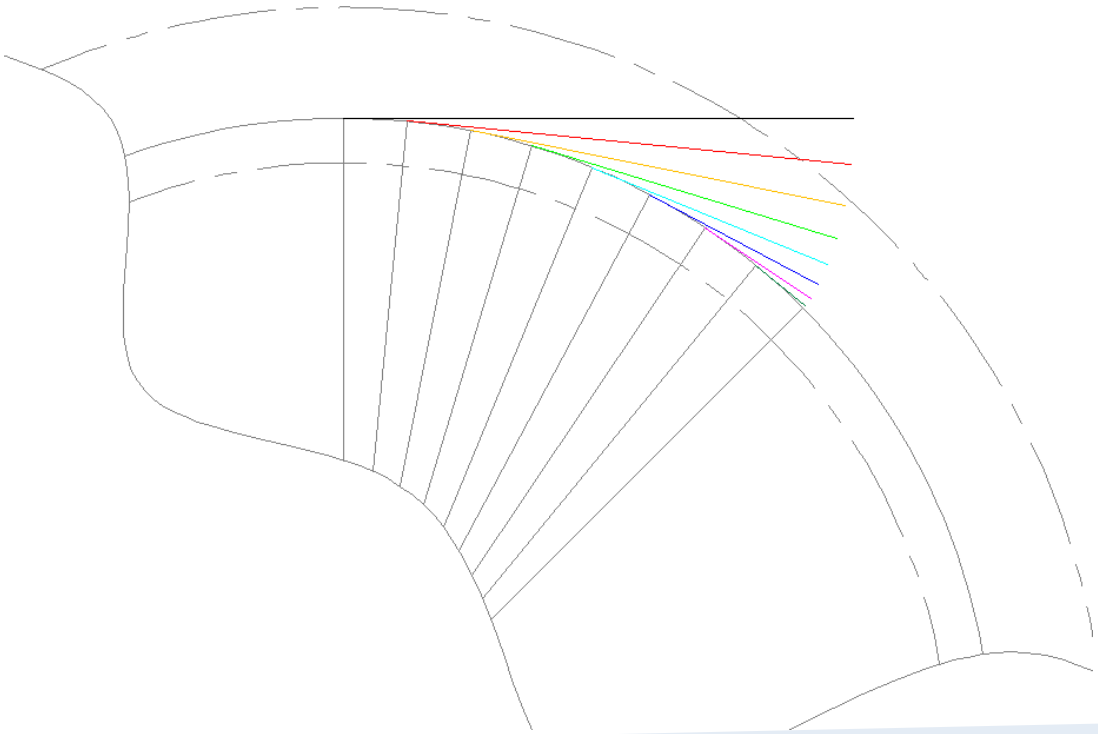
Step 4: Involute – Arc Trim

a. Delete the last tangent, the endpoint of the line on base circle at 45° is point a.
b. On the second to last tangent, keep a length of 7.3803 mm, trim the rest. {s = rθ = (80*(cos20)*(PI/32))}



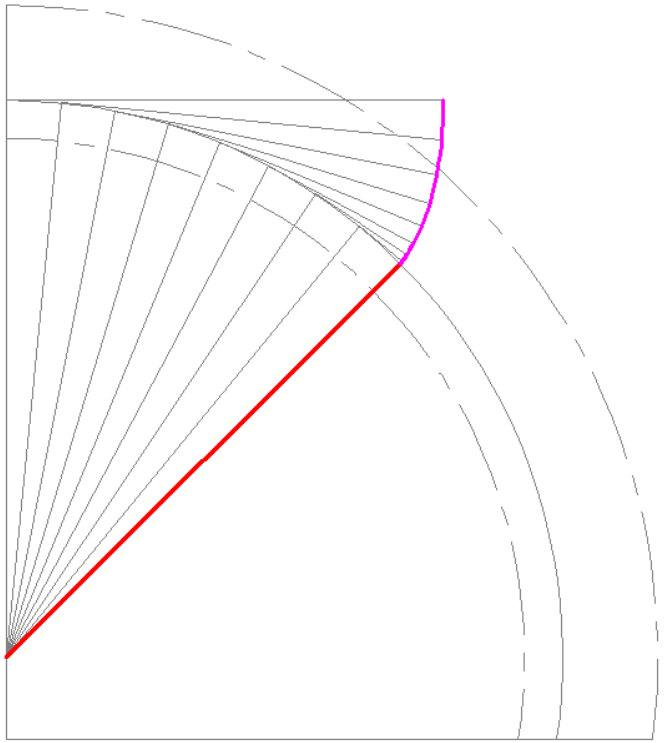
Step 5: Involute – Arc Trim Continued

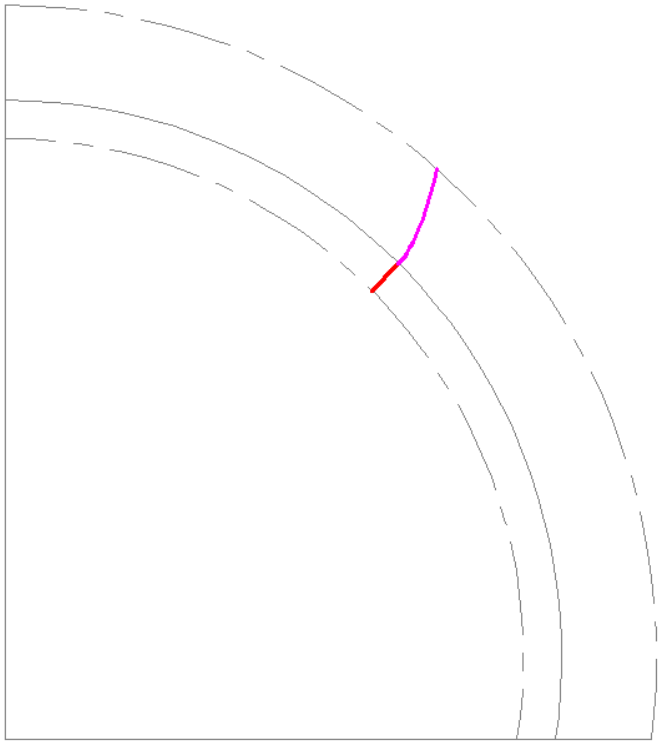
a. On the third to last tangent, keep a length of (7.3803*2) mm, trim the rest. {s = rθ = (80*(cos20)*(PI/16))}
b. On the fourth to last tangent, keep a length of (7.3803*3) mm, trim the rest. {s=rθ=(80*(cos20)*(3*PI/32))}
c. On the fifth to last tangent, keep a length of (7.3803*4) mm, trim the rest. {s=rθ=(80*(cos20)*(PI/8))}
d. Continue doing so up to the first tangent.



Step : Involute – Profile

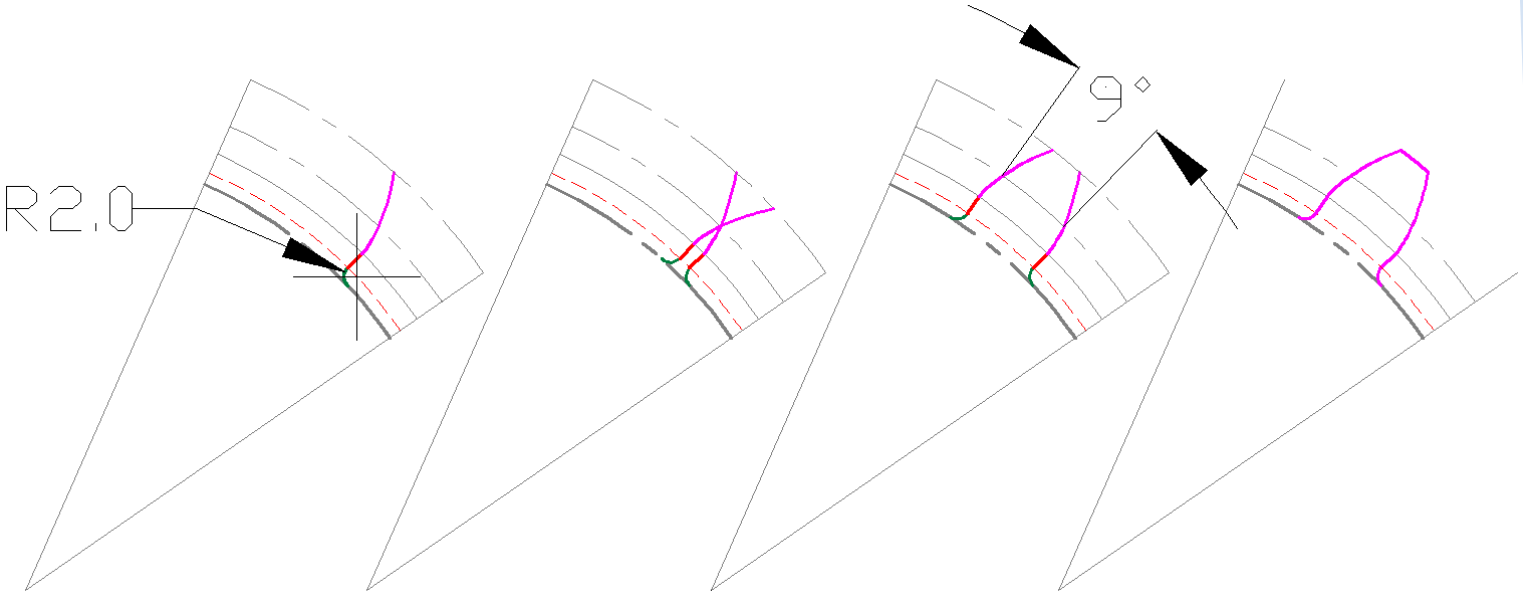
a. Join all the open ends of the tangents with a spline
b. Trim off the portion of spline over addendum circle, and the portion of radial line below dedendum circle.





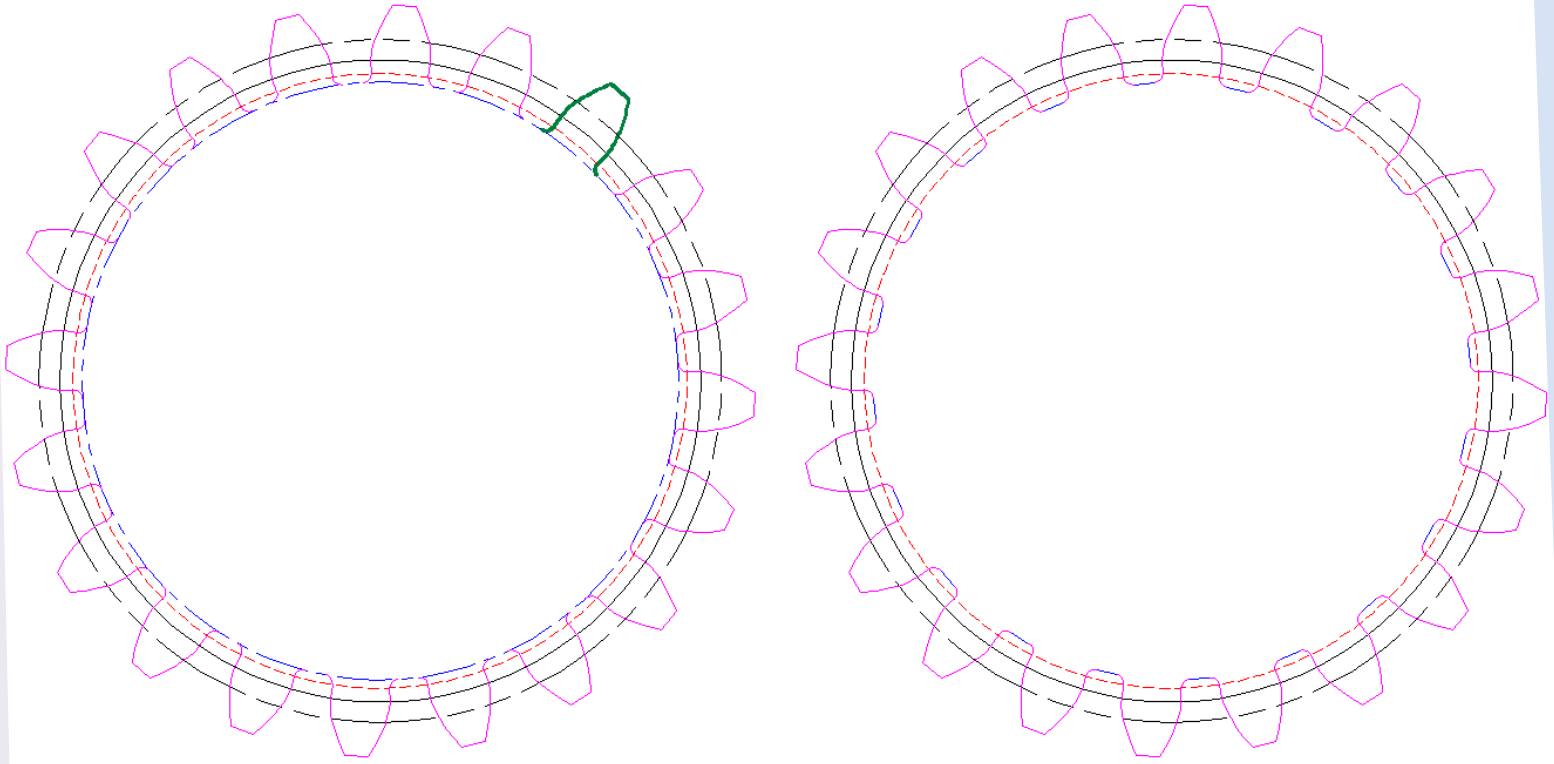
Step : Tooth Generation

a. Draw a 2 mm fillet at the base of the teeth (between the radial line and dedendum circle); Fillet radius = c = b-a
b. Taking the line joining the centre and the intersection point of the profile and pitch circle as the mirror line, mirror the profile.
c. Rotate the mirrored profile 9 degrees or (2*π/40) radians; Rotation base point is at the centre of the pitch circle . Angle = 2π/(Number of teeth + Number of gaps) = 2π/(2*Number of teeth)
d. Trim off the addendum circle.



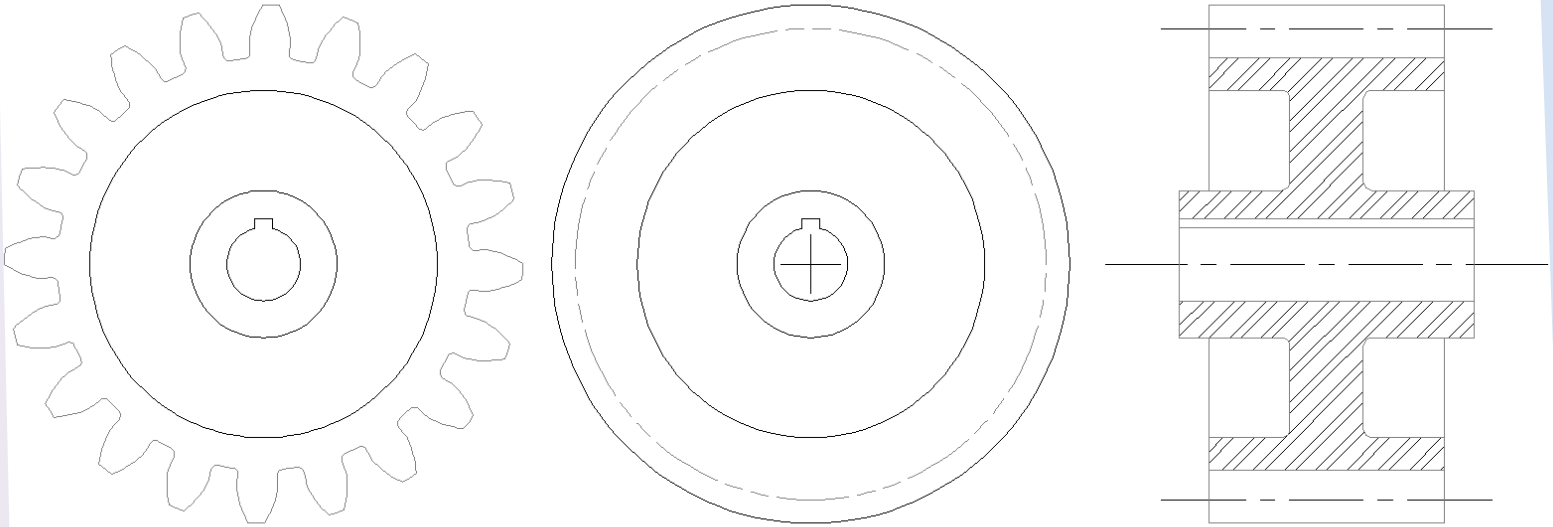
Step : Tooth – Array

a. Draw a 20 element polar array with the teeth profile all around.
b. Trim off unnecessary portions.



Step : Finals

a. Draw the Hub, Keyway etc
b. For the simplified view, replace the profiles with addendum and pitch circle.
c. Draw the sectional view using extension lines.



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