MTM Assignment 10-02-2017

1) $\gamma_o = \gamma_{max}$, then a) $\lambda = 0$, b) $\lambda > 0$ c) $\lambda < 0$

2) $\gamma_o = \gamma_n$, then a) $\gamma_o = \gamma_{max}$, b) $\gamma_o < \gamma_{max}$, c) $\gamma_o > \gamma_{max}$

3) $\phi = 90^\circ$, Angle between π_o and $\pi_N = 0$, then a) $\gamma_y = 0$, b) $\gamma_y > 0$, c) $\gamma_y < 0$

4) $\phi = 45^\circ$, $\phi_\gamma = 45^\circ$. then a) $\lambda = 0$, b) $\lambda > 0$, c) $\lambda < 0$

5) $\phi = 45^\circ$, $\phi_\gamma = 45^\circ$, then a) $\gamma_x = \gamma_y$, b) $\gamma_x > \gamma_y$, c) $\gamma_x < \gamma_y$

6) $\phi = 75^\circ$, $\phi_\gamma = 75^\circ$ then a) $\gamma_x = \gamma_y$, b) $\gamma_x > \gamma_y$, c) $\gamma_x < \gamma_y$

7) $\phi = 30^\circ$, $\phi_\gamma = 30^\circ$ then a) $\gamma_x = \gamma_y$, b) $\gamma_x > \gamma_y$, c) $\gamma_x < \gamma_y$.

8) $\gamma_o = \gamma_x = \gamma_{max}$, then a) $\phi = 90^\circ$ and $\lambda = 0$, b) $\phi \neq 90^\circ$ and $\lambda = 0$
c) $\phi = 90$ and $\lambda \neq 0$

9) $\phi = 45^\circ$, $\phi_\alpha = 45^\circ$ a) $\alpha_x = \alpha_y$, b) $\alpha_x > \alpha_y$ c) $\alpha_x < \alpha_y$

10) $\phi = 75^\circ$, $\phi_\alpha = 75^\circ$ then a) $\alpha_x = \alpha_y$, b) $\alpha_x > \alpha_y$, c) $\alpha_x < \alpha_y$.

11) $\phi = 30^\circ$, $\phi_\alpha = 30^\circ$ then a) $\alpha_x = \alpha_y$ b) $\alpha_x < \alpha_y$ c) $\alpha_x > \alpha_y$

12) $\phi = 45^\circ$, $\phi_\alpha = 45^\circ$ then a) $\lambda = 0$, b) $\lambda > 0$, c) $\lambda < 0$

13) $\phi = 90^\circ$, $\lambda = 0$, $\gamma_o = +10^\circ$, Show Master line for Rake surface.

14) $\phi = 90^\circ$, $\lambda = 0$, $\gamma_o = -10^\circ$, Show Master line for Rake Surface.

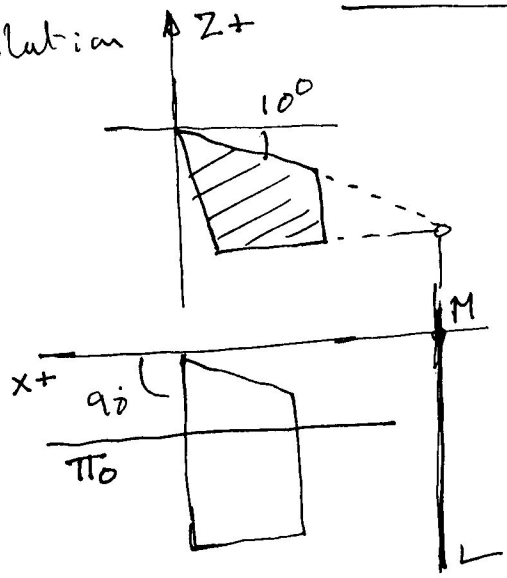
~~16) $\phi = 90^\circ$, $\phi_1 = 0$ $\phi = 75^\circ$, $\phi_1 (15^\circ)$ then a)~~

15) $\phi = 75^\circ$, $\phi_1 = 15^\circ$, $\gamma_o = +10^\circ$, $\lambda = -10^\circ$, then a) $\lambda' = 0^\circ$, b) $\lambda' = +10^\circ$, c) $\lambda' = -10^\circ$

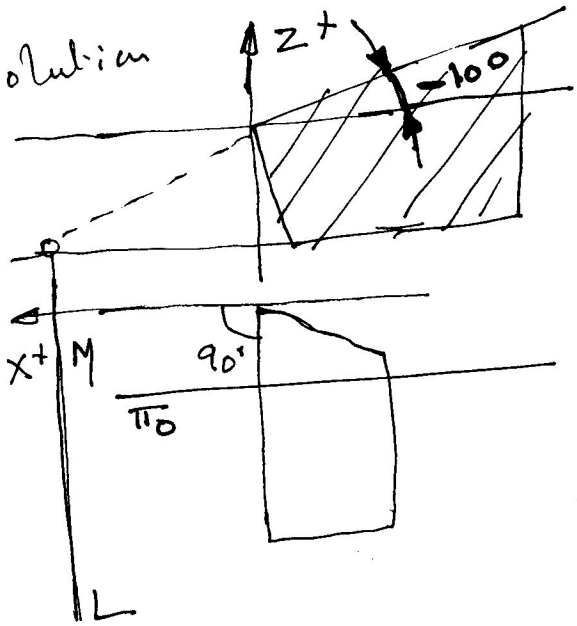
16) $\phi = 75^\circ$, $\phi_1 = 15^\circ$, then Angle between cutting planes for principal cutting edge and Auxiliary Cutting edge a) $= 90^\circ$ b) 75°, c) 60°

17) $\phi = 70^\circ$, $\phi_1 = 20$, $\gamma_o = 10^\circ$, $\lambda = -10^\circ$, Determine λ'. Ans. 10°

13) Solution



14) Solution



MTM lesson-2

1) A centre lathe can be engaged in longitudinal turning or facing.
   Given: RPM of lead screw=120, rpm of worm wheel (located in the apron box)=6, rpm of the pinion in mesh with rack=3 (for longitudinal turning), rpm of transverse feed screw=2. Find apron constant. Ans 40

2) Given: longitudinal turning, cutting velocity=30m/min, diameter of workpiece=30mm, transmission ratio between lathe spindle and lead screw=1/5, apron constant=50, module of pinion in mesh with rack=2.5mm, Z_{pinion}=20. Find longitudinal feed.
   Ans 0.628mm/rev
3) A sliding cluster speed gear box gives the following transmission ratios:
   1/2, 4/3 and 2/3. Find the driver and driven pair of gears giving those transmission ratios.
   Ans driver gear/driven gear : 35/70, 60/45, 42/63

4) Given : apron constant=40, rpm of lead screw=150, rpm of lathe spindle=300, transmission ratio between worm wheel and pinion in mesh with rack= 1/2 and that between worm wheel and transverse screw=1/3, pitch of transverse feed screw=6mm. Find transverse feed. Ans 0.05 mm/rev
5) A lathe is set to cut a metric thread having 2mm pitch. Pitch of lead screw=6mm, Transmission ratio of multiplier=1. A module thread is to be cut (module=2mm) without changing the transmission ratio of the feed gear box. Determine transmission ratio and number of teeth of driver and driven gear in the multiplier. Ans 66/21.
6) Angle between cutting plane containing principal cutting edge (π_C) and the cutting plane containing auxiliary cutting edge ($\pi_{C'}$) measured on the reference plane is found to be 90°. Given λ=-10° and γ_o=10°. Find λ'. Ans 10°

MTM lesson 2 - Solution page 1

Prob 1

Speed reduction in Worm and Worm wheel mechanism

$$= \frac{\text{rpm of worm wheel}}{\text{rpm of worm}} = \frac{6}{120} = \frac{1}{20}$$

Also $\frac{\text{rpm of pinion}}{\text{rpm of worm wheel}} = \frac{3}{6} = \frac{1}{2}$

$\therefore$ Total reduction from lead screw to the pinion $= \frac{1}{20} \times \frac{1}{2} = \frac{1}{40}$

Apron constant $= \frac{1}{\frac{1}{40}} = 40$

Prob 2 $V_c = \pi D N$

i.e., $30 \times 1000 = \pi \times 30 \times N$

i.e., $N = \frac{1000}{\pi}$ rpm (spindle rpm).

For 1 rotation of W/P, no. of rotation of the pinion $= 1 \times \frac{1}{5} \times \frac{1}{50}$ ($\because$ Apron constant = 50).

$\therefore$ For 1 rotation of W/P,
peripheral movement of the pinion over the rack
$= 1 \times \frac{1}{5} \times \frac{1}{50} \times 3.14 \times 2.5 \times 20$ ($\because$ module of pinion = 2.5 mm and no. of teeth of pinion = 20)

$= .628$ mm.

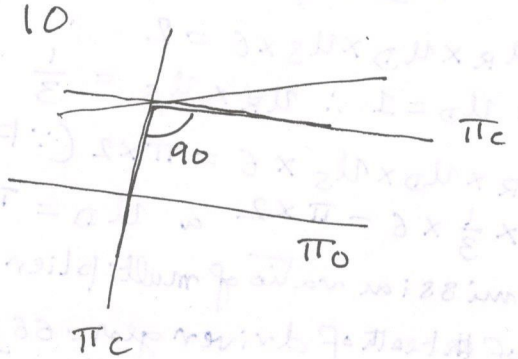
$\therefore$ Longitudinal feed = .628 mm/rev.

Prob 6 π_c and π_c' are at right angle.

$\therefore$ π_o for principal cutting edge is parallel to π_c'

$\therefore$ $\gamma_o = \lambda'$

$\therefore$ $\lambda' = 10^\circ$



Prob 3) Transmission ratios

$\frac{1}{2}, \frac{4}{3}, \frac{2}{3}$

Summation of numerator and denominator are

$(1+2=3)$, $(4+3=7)$ and $(2+3=5)$.

LCM of 3, 7 and 5 = 105

$\frac{1}{2}$ is the lowest transmission ratio

$\therefore K \times 105 \times \frac{1}{1+2} \geq 17$ (minimum number of teeth of a gear should be 17).

or, $K \times 21 \geq 17$ (where K is an integer).

$\therefore K \geq \frac{17}{21}$ or $K = 1$.

$\therefore$ Summation of no of teeth = 105 (for any driver and driven pair).

$\therefore$ Gear teeth ratios are $\frac{35}{70}, \frac{60}{45}$ and $\frac{42}{63}$

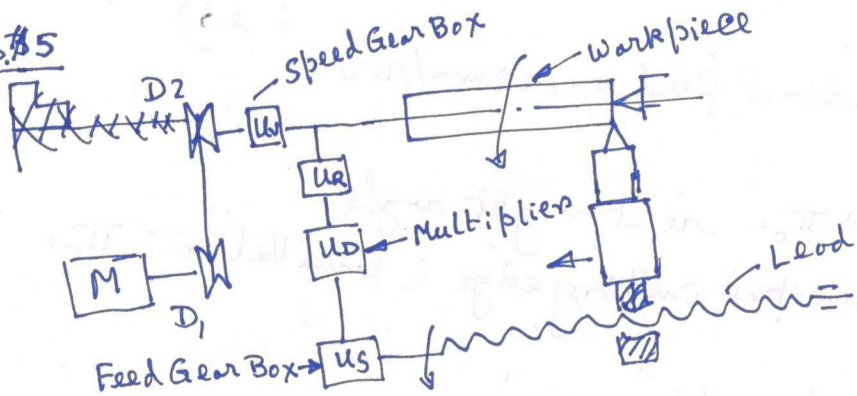
Prob 4) Apron constant = 40

$\therefore$ Transmission coefficient of worm-~~wheel~~ worm wheel mechanism $= \frac{1}{40} \times 2 = \frac{1}{20}$ ($\because$ transmission ratio between worm wheel and the pinion in mesh with rack $= \frac{1}{2}$)

$\therefore$ for 1 rotation of the workpiece, no. of rotation of the transverse feed screw $= \frac{150}{300} \times \frac{1}{20} \times \frac{1}{3} = \frac{1}{120}$

$\therefore$ Transverse feed $= \frac{1}{120} \times 6 = 0.05$ mm/rev ($\because$ pitch of transverse feed screw = 6 mm)

Prob #5



Given $1 \times U_R \times U_D \times U_S \times 6 = 2$

Also $U_D = 1$ $\therefore U_R \times U_S = \frac{1}{3}$

Now $1 \times U_R \times U_D \times U_S \times 6 = \pi \times 2$ ($\because$ pitch of the module thread = $\pi \times 2$ mm)

or, $U_D \times \frac{1}{3} \times 6 = \pi \times 2$ or $U_D = \pi = \frac{22}{7} = \frac{66}{21}$ ($\because$ minimum no. of teeth ≥ 17)

$\therefore$ Transmission ratio of multiplier $= \frac{22}{7}$

and no of teeth of driver gear = 66, no of teeth of driven gear = 21