Gear dimension calculations – LAB-8

Inner gears:

ONLY THESE INFO ARE REQUIRED → all others can be calculated

① pitch dia (gear) = $d_{P_2} = 80$ mm

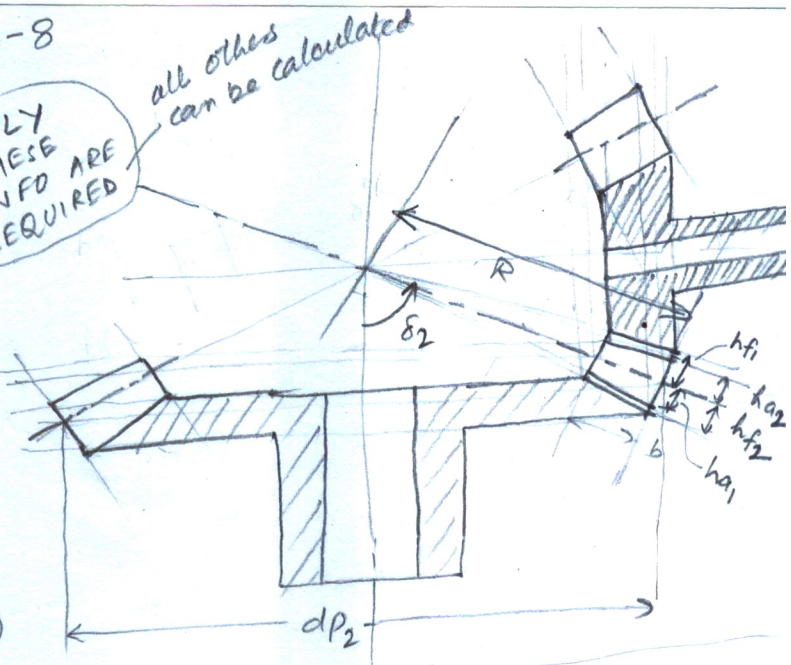
② # teeth in gear = $N_2 = 40$

③ # teeth in pinion = $N_1 = 20$

④ Thus, module = $d_{P_2}/N_2 = 80/40 = 2$

⑤ Half cone angle (gear) = $\delta_2 = \tan^{-1}(N_2/N_1)$
$= \tan^{-1}(40/20)$
$\Rightarrow \delta_2 = 63.4°$

⑥ Half cone angle (pinion) = $\delta_1 = 90° - \delta_2$
$= 26.6°$ (not needed)



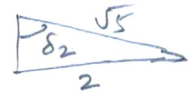
⑦ $R \sin\delta_2 = d_{P_2}/2 \Rightarrow R = \frac{d_{P_2}}{2\sin\delta_2} = \frac{80/2}{2/\sqrt{5}}$

$\Rightarrow R = 20\sqrt{5} \approx 45$

Note :– $\because \delta_2 = 90° - \delta_1$

$\frac{N_2}{N_1}\frac{\cos\delta_1}{\cos\delta_2} = \frac{N_2}{N_1}\frac{\sin\delta_2}{\cos\delta_2}$

$= \frac{N_2}{N_1}\cdot\frac{N_2}{N_1} = 4$



$\tan\delta_2 = 2$

$\Rightarrow \sin\delta_2 = 2/\sqrt{5}$

⑧ $b \le R/3 \Rightarrow b = 15$ (taking max value)

⑨ $h_{a_2} = 0.54m + \frac{0.46m}{\frac{N_2}{N_1}\frac{\cos\delta_1}{\cos\delta_2}} = (0.56 + 0.46/4)m$

$\Rightarrow h_{a_2} = 0.665m = 1.33$ ← gear – addendum

⑩ $h_{a_1} = 2m - h_{a_2} = (2 - 0.665)m = 1.335m$

$\Rightarrow h_{a_1} = 2.67$ ← pinion – addendum

⑪ $h_{f_1} = 2.188m - h_{a_1} = (2.188 - 0.665)m$

$\Rightarrow h_{f_1} = 1.523m = 3.046$ – pinion – dedendum

⑫ $h_{f_2} = 2.188m - h_{a_2} = (2.188 - 1.335)m$

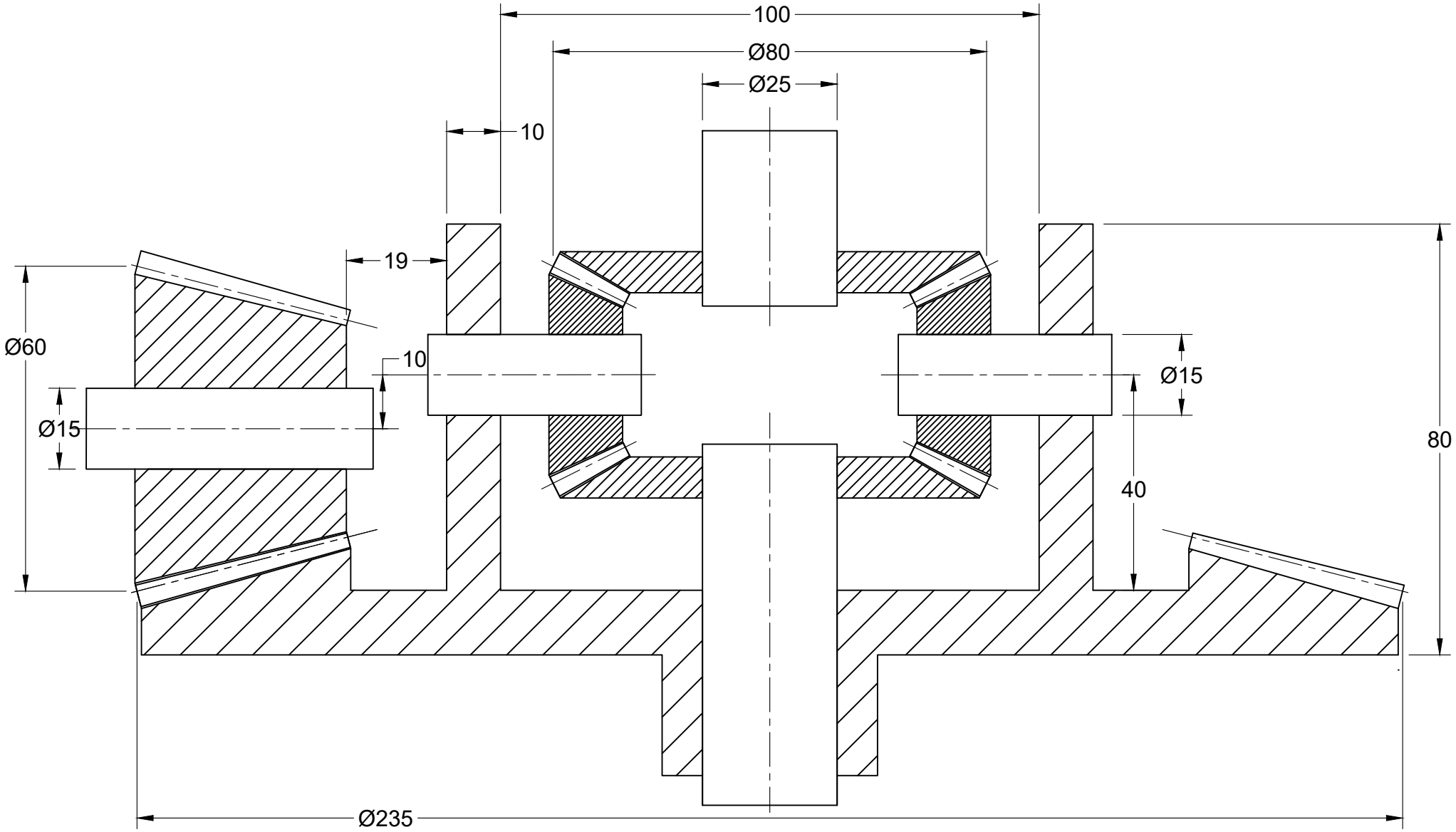
$\Rightarrow h_{f_2} = 0.853m = 1.706$ – gear – dedendum

Outer gears → DO IT YOURSELF – using $d_{P_1} = 60$, $d_{P_2} = 235$, $m = 2$ (same as above)

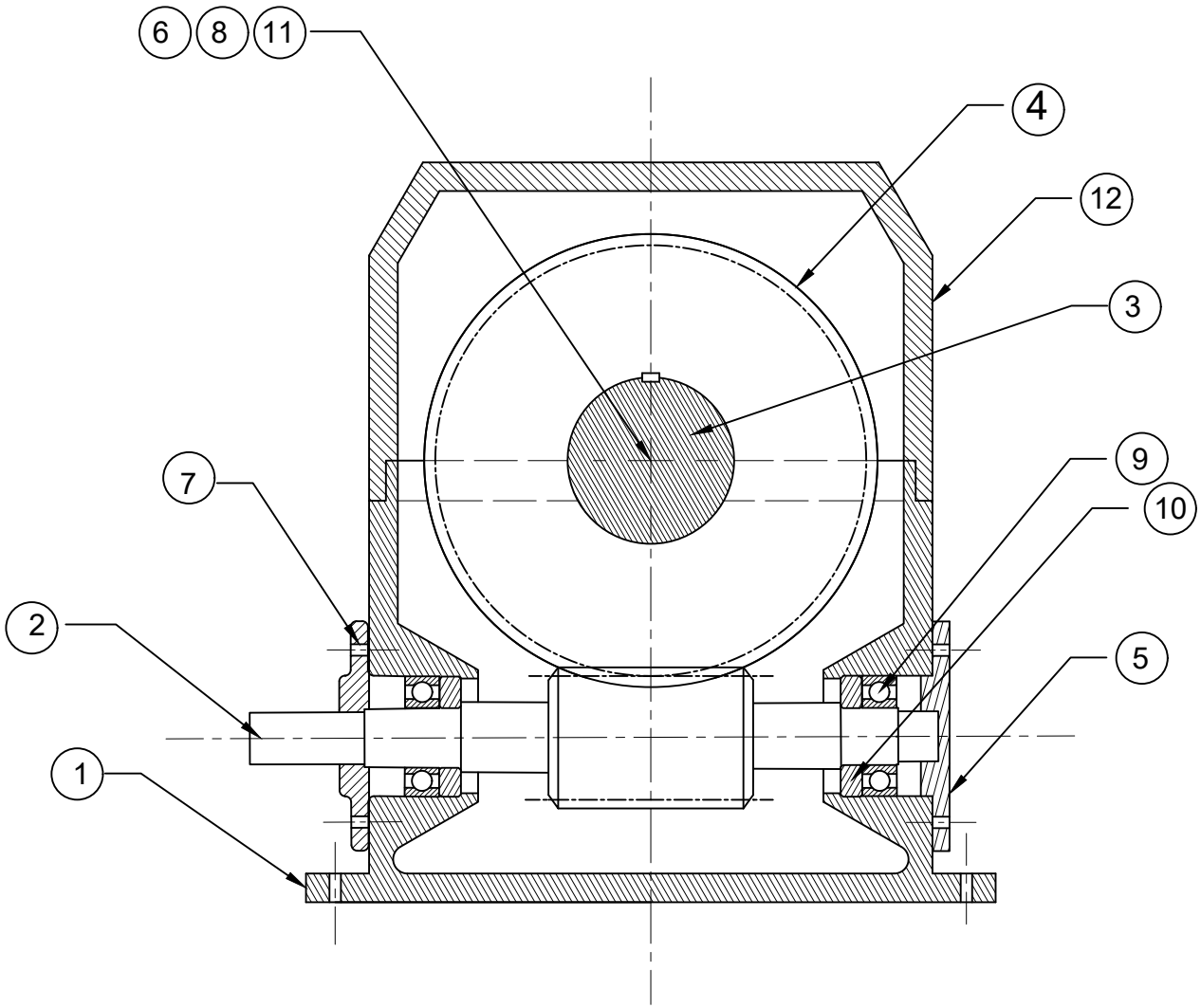
Results:

- $R = 121.3$, $b = 40.4$, $h_{a_1} = 2.86$ ← pinion; $h_{a_2} = 1.14$ ← gear; $h_{f_1} = 1.516$ ← pinion; $h_{f_2} = 3.236$ ← gear

Note – sum = 4.376 ↑ equal sums ↓ sum = 4.376



ME251A - LAB 8	
TITLE: DIFFERENTIAL MECHANISM	
NAME: SHYAM SUNDER NISHAD	
ROLL:	SIGN:
DATE: 06.10.2108	
SCALE: 1:1	



BILL OF MATERIAL			
PART NO.	NAME	MATERIAL	QTY
1	HOUSING	CI	1
2	WORM SHAFT	MS	1
3	WHEEL SHAFT	MS	1
4	WORM WHEEL	MS	1
5	END COVER	CI	1
6	ROLLER BEARING		2
7	END COVER	CI	1
8	END COVER WHEEL SHAFT	CI	2
9	BALL BEARING		2
10	OIL SEAL	RUBBER	2
11	OIL SEAL	RUBBER	2
12	TOP COVER	CI	1