PROJECT TITLE

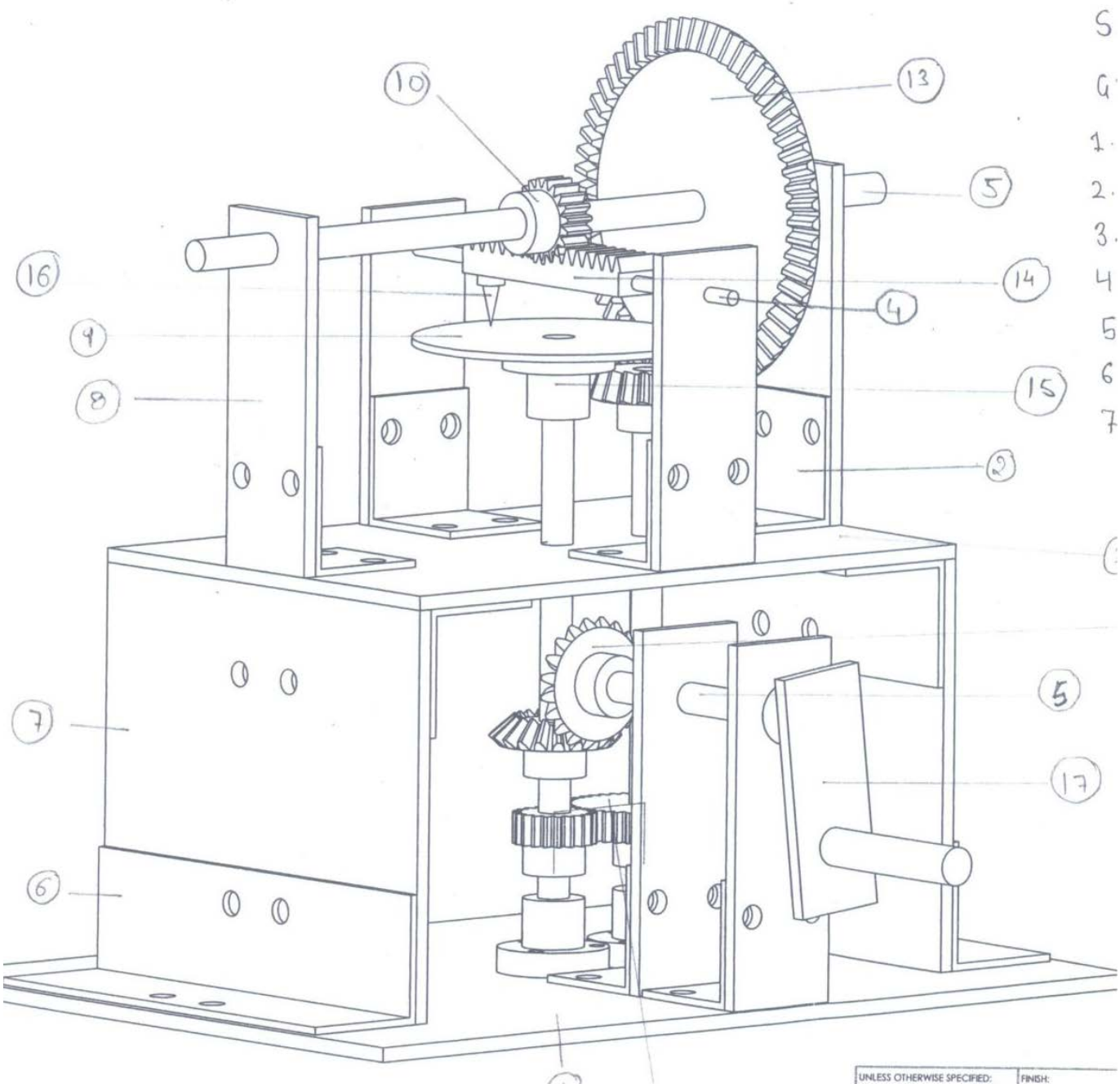
GR.NO.: –

GROUP MEMBER'S NAME

GUIDE NAME:

TUTOR:

TITLE OF THE PROJECT



Gr. No. :---------

Section :-------

Name of students Roll No.

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4	Axle of Worm Wheel	Φ16x150	4	1
5	Worm Wheel	Φ62.834	5	2
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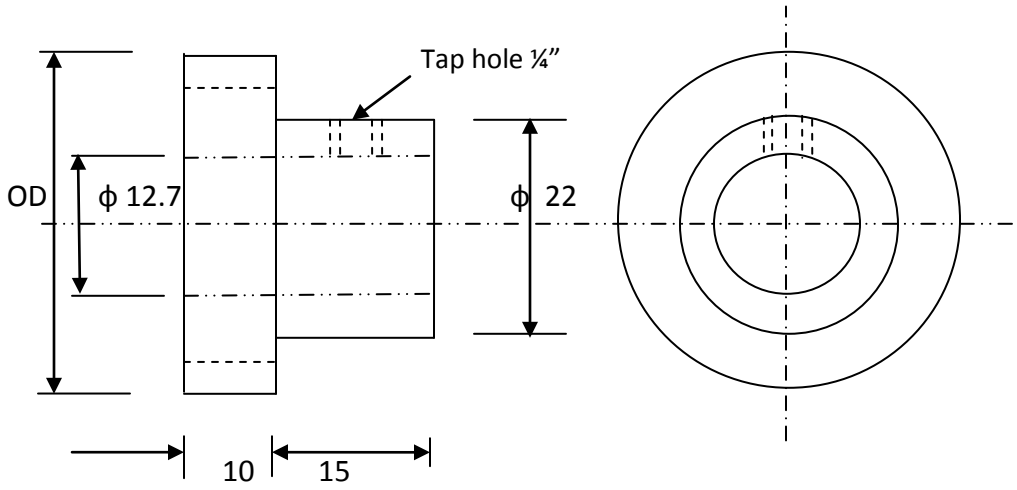
Spur Gear

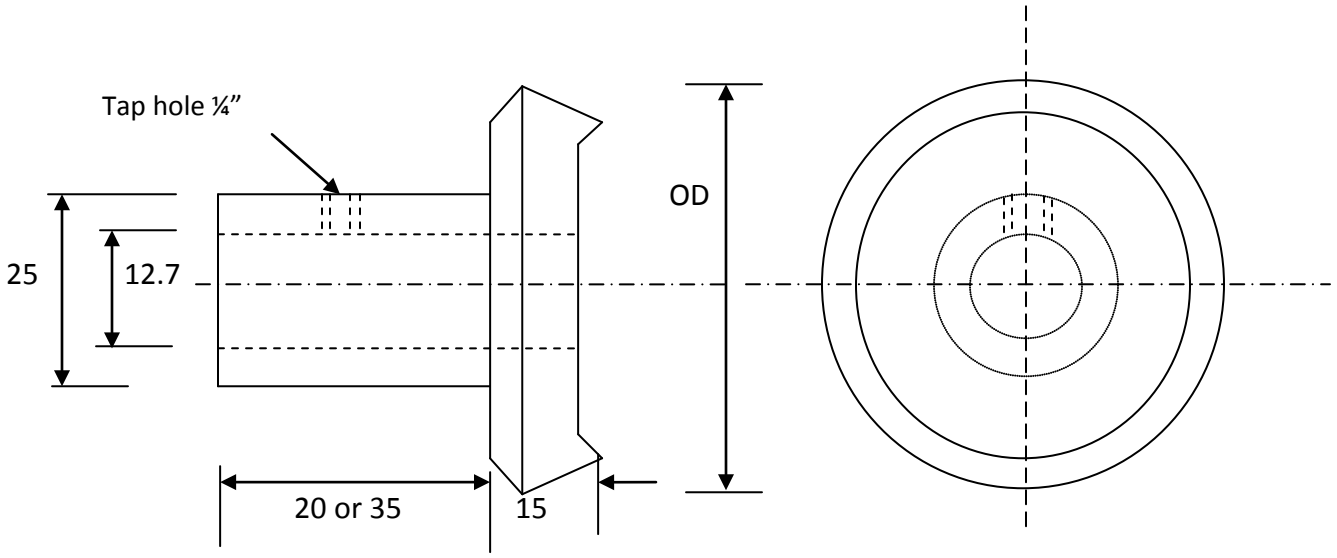


Quantity	=	
Nos. of Teeth (N)	=	
Module (M)	=	1.5
Outer diameter (OD)	=	M (N +2)
Rod diameter (ID)	=	12.7 or 16
Depth of cut	=	2.157 X M
Tap hole size	=	5.2 mm drill & ¼" tapping
Indexing calculation	=	40 / N

(All dimensions are in MM)

Required materials (Mild Steel)
Size: ϕ (diameter) X L(length)
Qty:

BEVEL GEAR



Gear Ratio, if = G : g

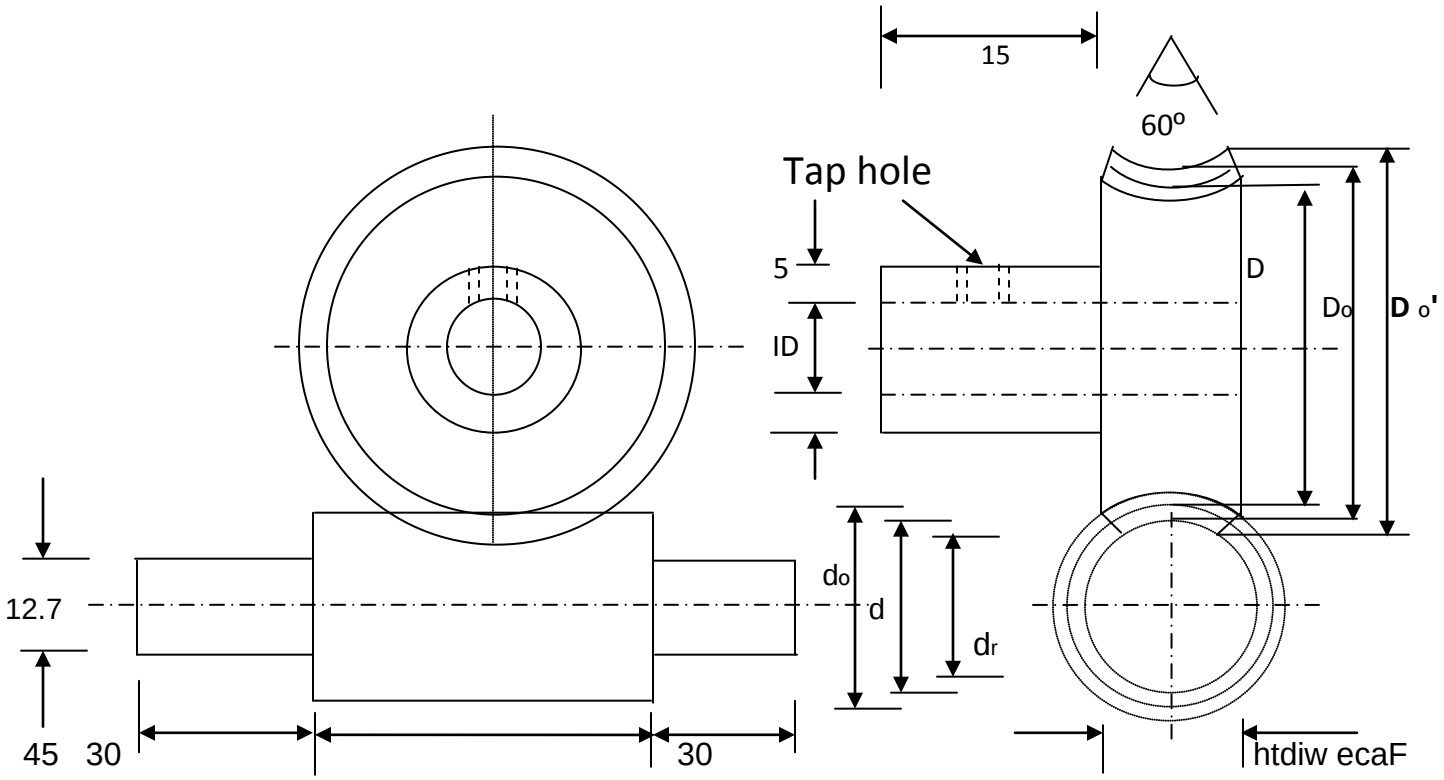
Quantity	=	2
Nos. of Teeth (N)	=	
Module (M)	=	1.5
Outer diameter (OD)	=	
Face Angle ($\Theta_G + \alpha$)	=	(for Lathe Machine)
Cutting Angle ($\emptyset_G$)	=	(for milling Machine)
Rod diameter (ID)	=	12.7 or 16
Depth of cut	=	2.157 X M
Tap hole size	=	5.2 mm drill & ¼" tapping
Indexing calculation	=	40 / N

Note: See gear calculation

(All dimensions are in MM)

Required materials (Mild Steel)
Size: ϕ (diameter) X L(length)
Qty:

WORM & WORM WHEEL (GEAR)



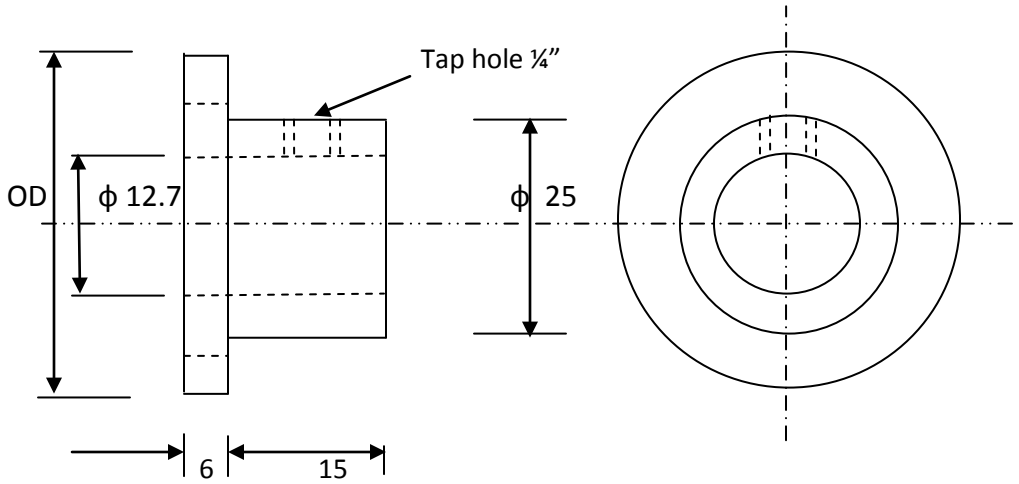
Ratio of Worm & worm wheel	=	1: 20 or 1:40
Outer diameter of worm (d_o)	=	22
Pitch of the worm	=	4.7
Depth of the worm	=	
Diameter over sharp corner (worm wheel) $\mathbf{D_o'}$	=	
Throat Diameter of worm wheel ($\mathbf{D_o}$)	=	
Depth of cut of the worm wheel	=	
Nos. of teeth of worm wheel	=	
Gashing Angle	=	(for milling m/c.)
Face width of worm wheel	=	
Rod diameter (ID)	=	12.7 or 16
Tap hole size	=	5.2 mm drill & ¼" tapping
Indexing for teeth cutting	=	40/N

Note: See gear calculation

(All dimensions are in MM)

Required materials (Mild Steel)
Size: ϕ (diameter) X L(length)
Qty:

CHAIN SPROCKET GEAR

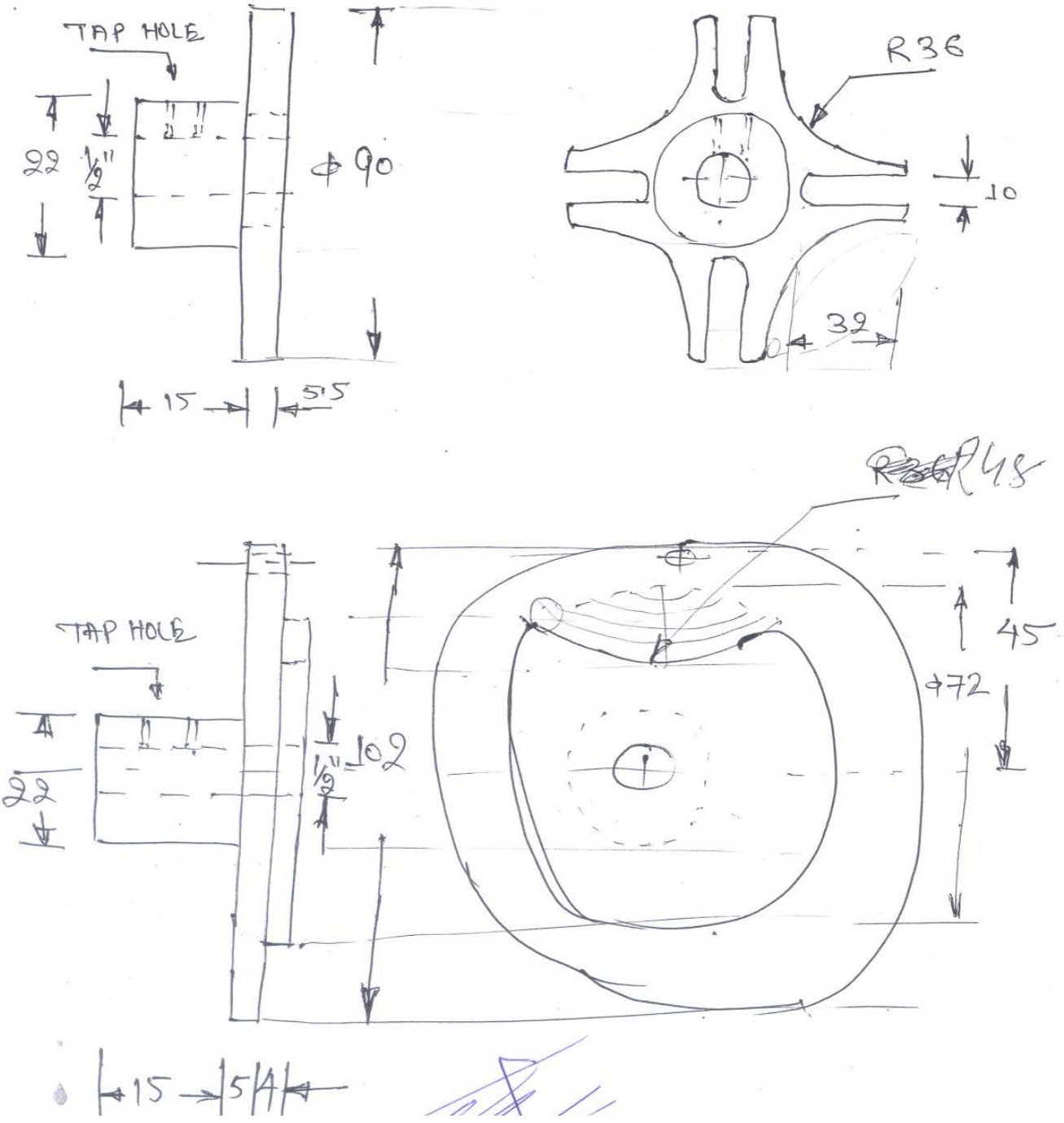


Quantity	=	
Nos. of Teeth (N)	=	Minimum 8
Module (M)	=	1.5
Roller diameter	=	0.315”
PCD	=	N X ½” / π
Outer diameter (OD)	=	PCD + Roller diameter
Root diameter	=	PCD – 0.315”
Rod diameter (ID)	=	12.7 or 16
Depth of cut	=	8
Tap hole size	=	5.2 mm drill & ¼” tapping
Indexing calculation	=	40 / N

(All dimensions are in MM)

Required materials (Mild Steel)
Size: ϕ (diameter) X L(length)
Qty:

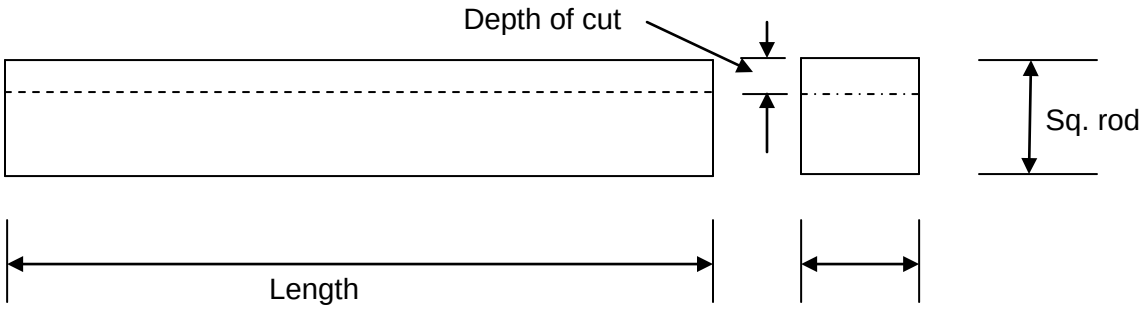
GENEWA WHEEL



(All dimensions are in MM)

Required materials (Aluminum) / (MS)
Size: ϕ (110) X L(30) & ϕ (100) X L(25)
Qty: 1

RACK

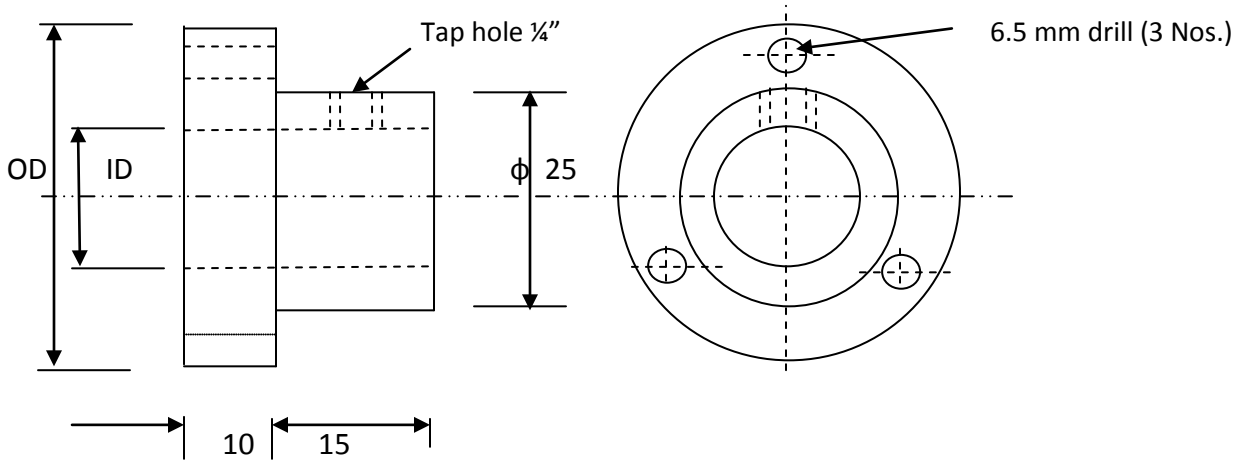


Module (M)	=	1.5
Pitch	=	M x π
Depth	=	2.157 x M
Size of square rod	=	½" x ½"

(All dimensions are in MM)

Required materials (Mild Steel)
Size: ϕ (diameter) X L(length)
Qty:

DISC



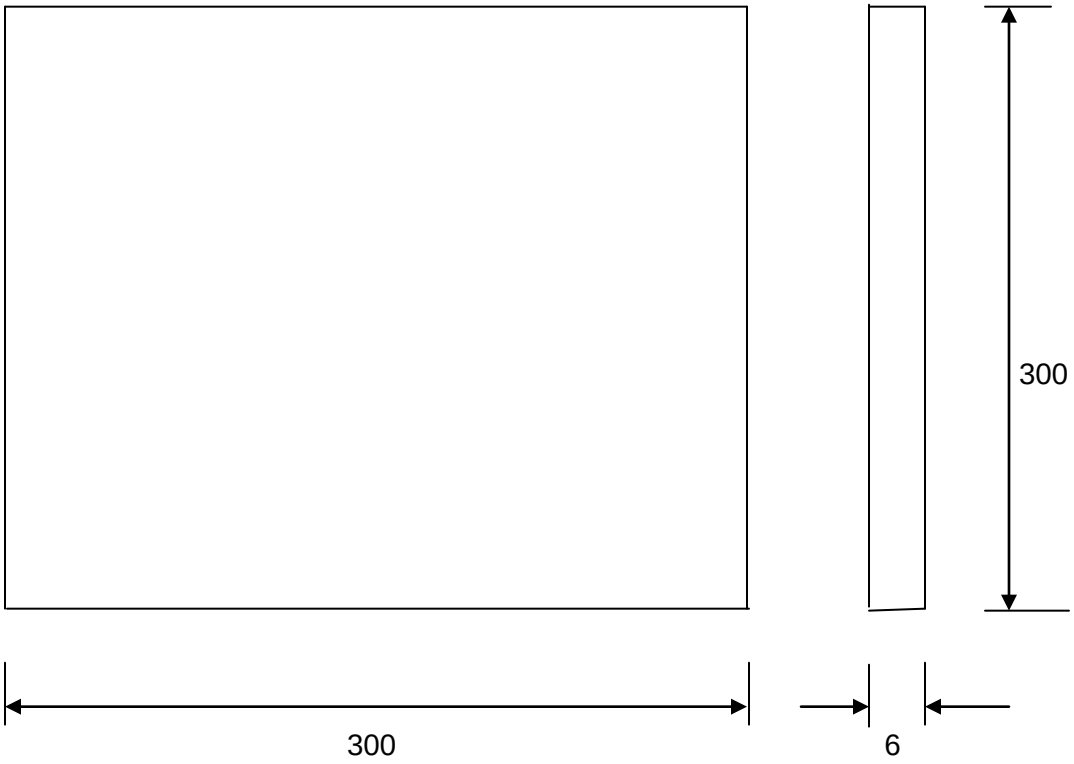
Rod diameter (ID) = 12.7 or 16

(All dimensions are in MM)

Required materials (Mild Steel)
Size: ϕ (diameter) X L(length)
Qty:

PART NO. PAGE NO.

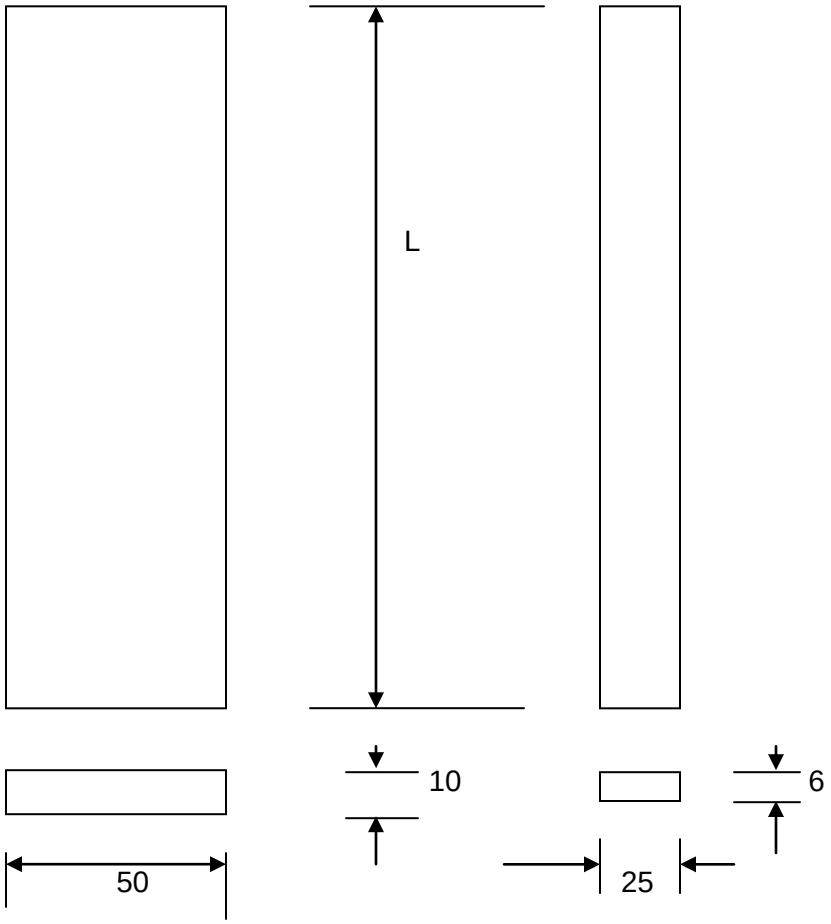
BASE PLATE



(All dimensions are in MM)

Required materials (Mild Steel)
Size:
Qty:

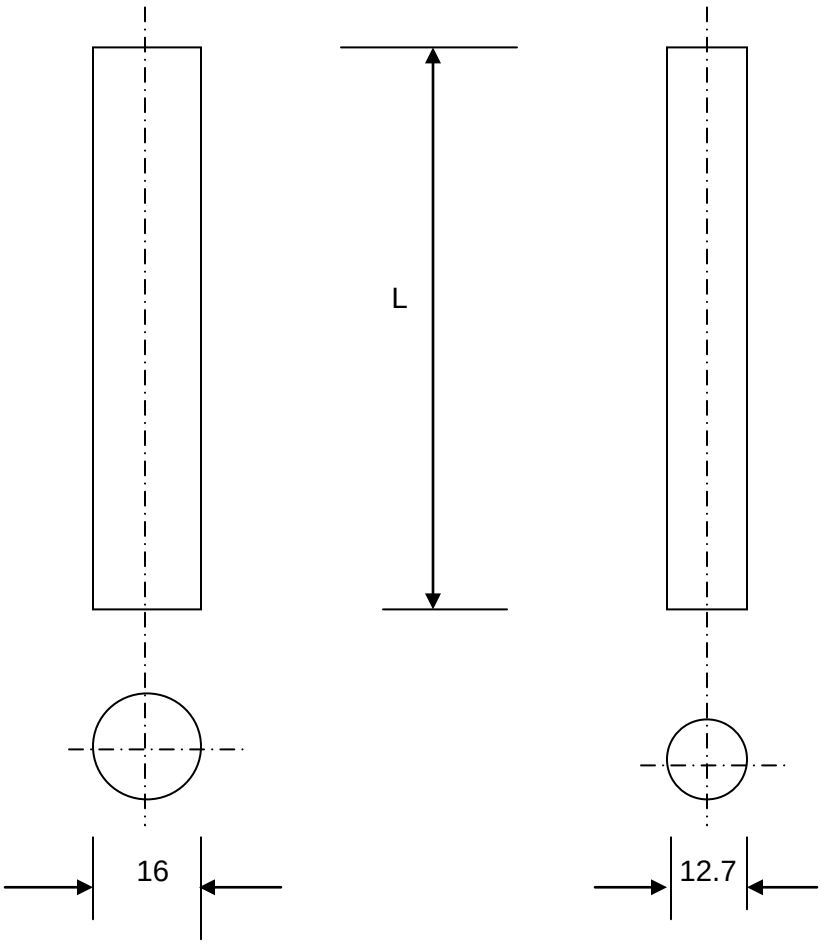
SUPPORT



(All dimensions are in MM)

Required materials (Mild Steel)
Flat Size: (50 X 10) X L & (25 X 6) X L
Qty:

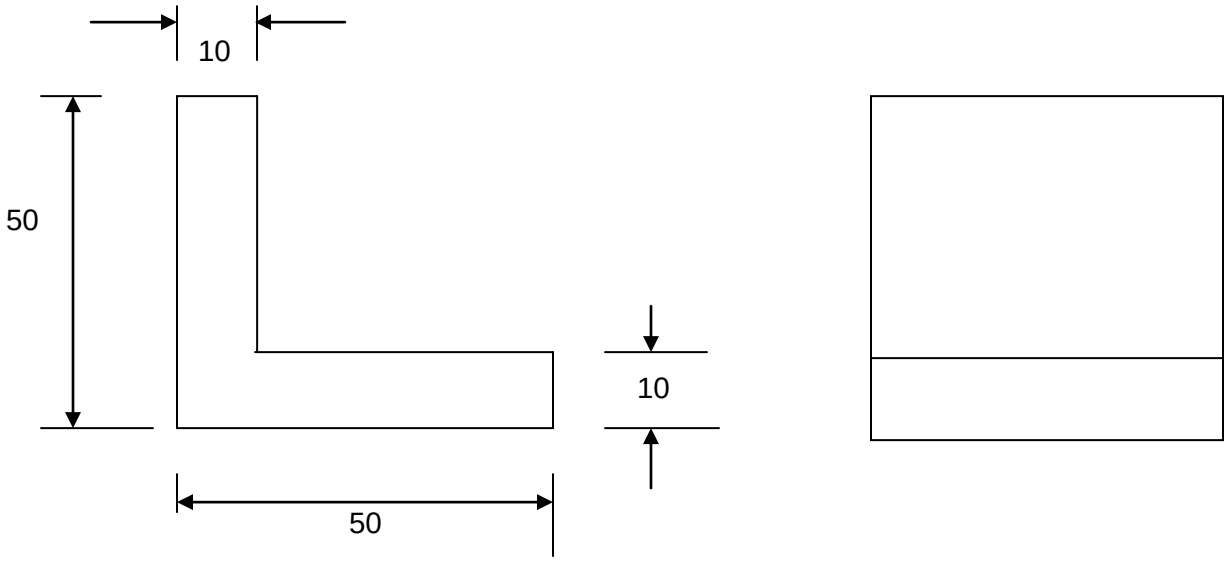
ROD



(All dimensions are in MM)

Required materials (Mild Steel)
Rod Size: (ϕ 16 X L) & (ϕ 12.7 X L)
Qty:

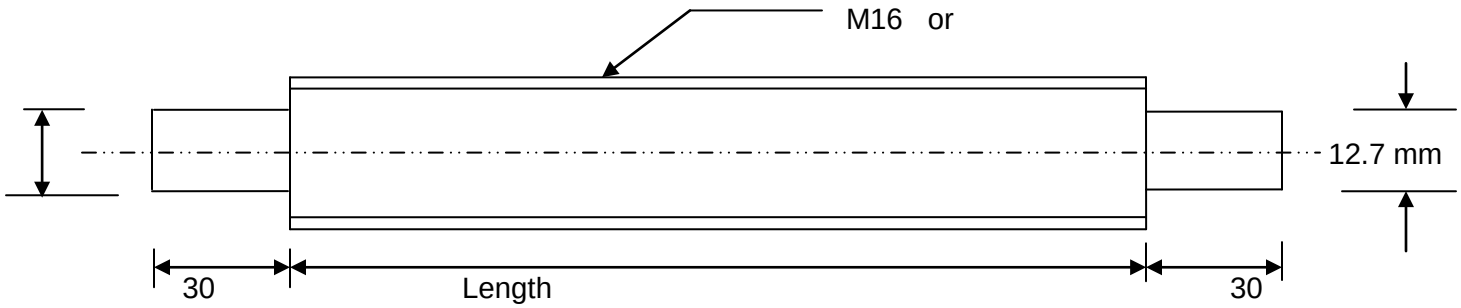
ANGLE



(All dimensions are in MM)

Required materials (Mild Steel)
Angle Size: (50 X 50 X 10) X L & (25 x 25 X 3) X L
Qty:

LEAD SCREW



(All dimensions are in MM)

Required materials (Mild Steel) Angle Size: Φ 16 X L Qty:

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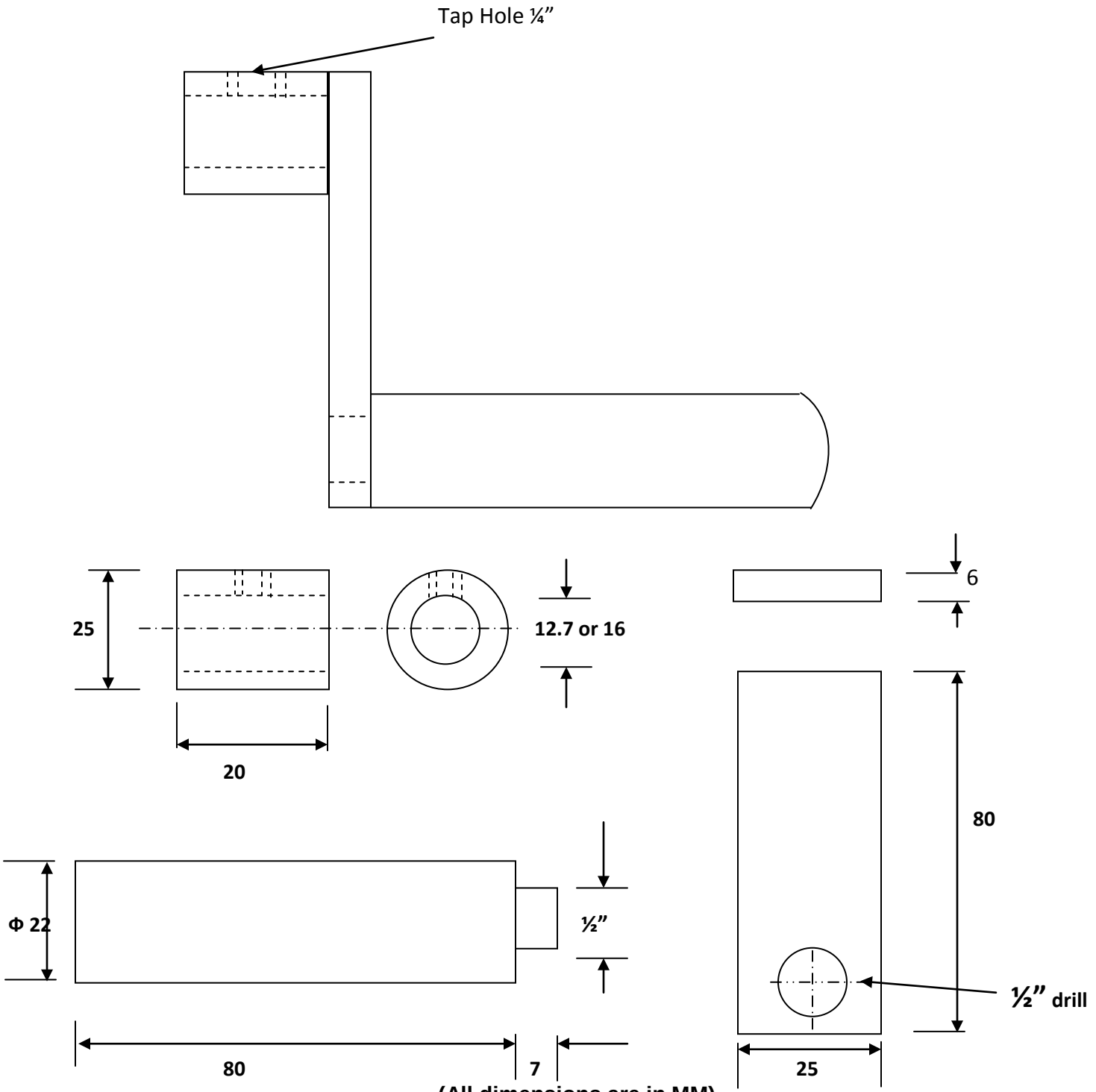
HANDLE

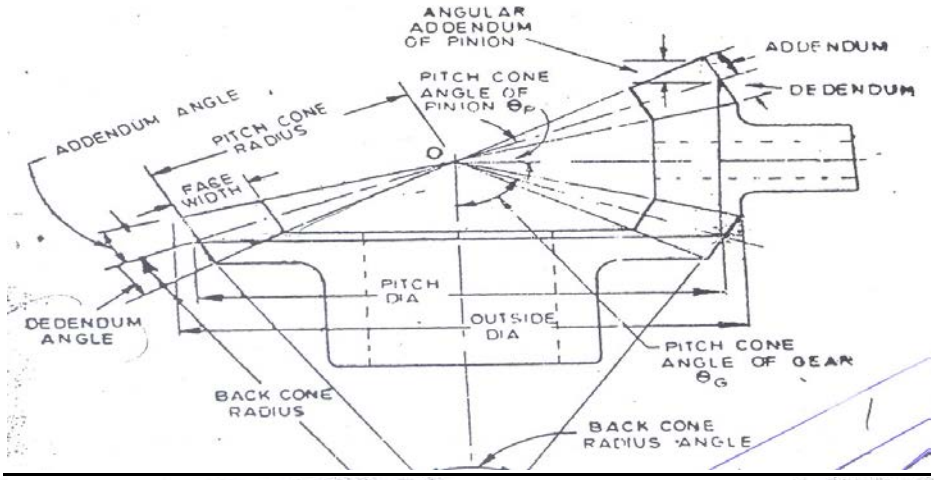


(All dimensions are in MM)

Required materials (Mild Steel)
Rod Size: (**Φ** 22 X 90) & (**Φ** 25 X 20)
Flat size : (25 X 6) X 80
Qty: 1 each

CALCULATION FOR BEVEL GEAR

Que. A Pair of bevel gears is designed whose axes are at 90º. The pinion has 40 teeth and gear has 80 teeth with a module of 1.5 mm. Determine the dimensions of various principal parts and describe the various steps to manufacture it.



Pitch diameter of gear D = N x m = 80 x 1.5 = **120 mm**

Pitch diameter of pinion d = n x m = 40 x 1.5 = **60mm**

Pitch cone angle of gear Tan θ_G = N/n = 80/40 = 2

$\theta_G = 63^\circ 26'$

Pitch cone angle of the pinion $\theta_p = 90 - \theta_p = 90 - 63^\circ 26'$

$\theta_p = 26^\circ 34'$

Pitch cone radious (R) for both gear and pinion = m/2 $\sqrt{N^2 + n^2}$ = 1.5/2 $\sqrt{80^2 + 40^2}$ = **67.08 mm**

Addendum for both gear and pinion = m = **1.5 mm**

Addendum angle (α) Tan α = Addendum /R = 1.5 / 67.08

$\alpha = 1^\circ 18'$

Dedendum for both gear and pinion = 1.157 x m = 1.157 x 1.5 = **1.736 mm**

Dedendum angle (β) Tan β = Dedendum / R =1.736 / 67.08

$\beta = 1^\circ 30'$

Whole depth at large end of tooth = Addendum + Dedendum = 1.5 +1.736 = **3.326 mm**

Tooth thickness at pitch line =1.5708 x m = 1.5708 x 1.5 = **2.3552 mm**

Cutting angle of gear $\varnothing_G = \theta_G - \beta = 63^\circ 26' - 1^\circ 30' =$ **61° 56'** **(For milling M/C)**

Face angle of gear = $\theta_G + \alpha$ **(For lathe M/C)**

Cutting angle of pinion $\varnothing_P = \theta_P - \beta = 26^\circ 34' - 1^\circ 30' =$ **25° 4'** **(For milling M/C)**

Face angle of gear = $\theta_P + \alpha$ **(For lathe M/C)**

Angular addendum of gear = addendum x Cos θ_G = 1.5 x Cos 63° 26' = **0.6708 mm**

Angular addendum of pinion =addendum Cos θ_P = 1.5 xCos 26 ° 34' = **1.342 mm**

Outside diameter of gear = D + 2 Cos θ_G x m =120 + 2 x Cos 63° 26' x 1.5 = **121.342 mm**

Outside diameter of pinion = d + 2 Cos θ_P x m = 60 + 2 x Cos 26 ° 34' x 1.5 = **62.684 mm**

No. of teeth needed to select a cutter for the gear N'= N / Cos θ_G = ?

No. of teeth needed to select a cutter for the pinion n' = n / Cos θ_P = ?

CALCULATION FOR SINGLE START WORM & WORM WHEEL(GEAR)

Outside diameter of Worm = 100 mm **(Use in project diameter is 22 mm standard)**

Pitch of the single start worm = 6 mm **(Use in project Pitch is 4.7 mm standard)**

Ratio of worm & worm wheel = 80 : 1

Face angle $\theta = 60^\circ$

Lead of worm = pitch x No. of start = 6 x 1 = **6 mm**

Addendum of the worm (a) $(d_o - d)/2$

= 0.3183 x Pitch = 0.3183 x 6 = **1.9098 mm**

Pitch diameter of the worm **(d)** = $d_o - 2a$ = 100 – 2 x 1.9098 = **96.1804 mm**

Depth of worm tooth **(h_t)** = $(d_o - d_r) / 2$

= 0.6866 x Pitch = 0.6866 x 6 = **4.1196 mm**

Root diameter of worm **(d_r)** = $d_o - 2h_t$ = 100 – 2 x 4.1196 = **91.7608 mm**

Pitch diameter of the wheel **(D)** = (N x P) / π = 80 x 6 / 3.1416 = **152.866 mm**

Centre distance between worm & worm wheel **(C)** = (D + d) / 2 = 152.866 + 96.1804 / 2

= **124.5232 mm**

Throat diameter of the wheel **(D_0)** = D + 2 a = 152.866 + 2 x 1.9098 = **156.6856 mm**

Throat radius of the worm wheel **(r)** = $d_o / 2 - 2a$ = 100 / 2 – 3.8196 = **46.1804 mm**

Diameter of the wheel over the sharp corners **(D_0')** = $2r (1 - \cos \theta / 2) + D_0$ = **169.0618 mm**

Face width of the wheel = 2.38 p + 6.35 mm = **20.63 mm**

Helix angle of worm Tan α_ω = π d / lead = 3.14 x 96.1804 / 6 = 50.334

$\alpha_\omega = 88^\circ 51'$

Gashing angle of the worm wheel $\alpha_g = 90 - \alpha_\omega$ = **1° 9'**

Ref.book: Production Technology, Khanna Publication, by. Dr.R.K.Jain, edit by: Aman Singh, amans@,