Intro – planetary gears also refer as epicyclic gearing consisting three elements sun gear, planet gear and ring gear. Sun gear is located at the center that transmits torque to planet gears orbiting around the sun gear. Both systems are located inside the ring gear. In the toothed formation sun and planet gears are externally mesh and ring gear internally meshes. (See Fig. 01)

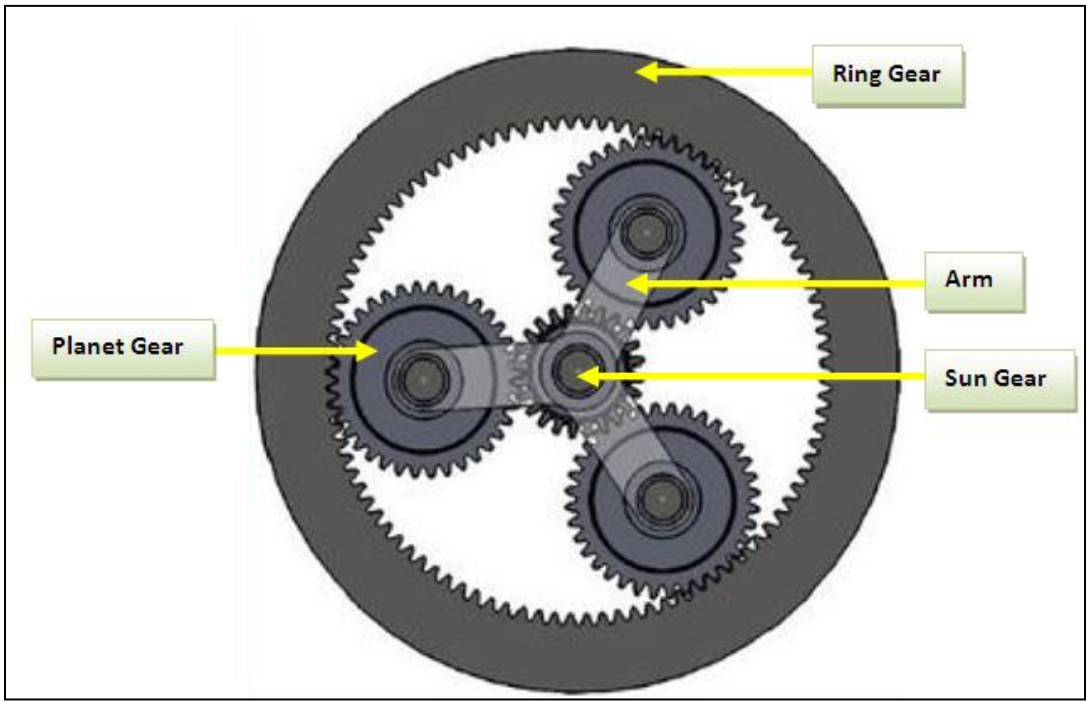


Fig. 01

Planetary gear is found in many variation and arrangements to meet a broad range of speed-ratio in the deign requirements. Planetary gear system is use in varies applications such as, clocks, lunar calendar, car mirror, toys, gearhead motor, turbine engine and many more.

For detail understanding on the planetary gear:
http://en.wikipedia.org/wiki/Epicyclic_gearing

Planetary Gear Design

Planetary gear system will no assemble unless the number of teeth in each gear is selected properly.

Planetary spur gear drive ratio 5:1 means the sun gear must make 5 revolutions for each revolution of the output carrier.

Desired number of teeth in the sun gear is 24.

Design requirements:

Ratio = 5:1

Sun gear = 24

Module = 1

Since, I am working in the metric unit every dimension will be in mm. Selecting gears in metric unit the gear tooth profile of the spur gear will be in Module.

M = Module

N = Number of teeth

N_R = Number of teeth on the ring gear

P_D= Pitch Diameter

R = Ratio

$$P_{Ds} = \frac{N}{M} = \frac{24}{1} = 24mm \qquad \text{Eq. 01}$$

Pitch diameter of the sun gear is 24.

Calculate the number if teeth required in the ring gear for the ratio 5:1.

$$R = 1 + \frac{N_R}{P_D} \qquad \text{Eq. 02}$$

Solve for N_R

$$N_R = P_D(R - 1) = 24(5 - 1) = 24(4) = 96\ teeth$$

Pitch diameter of the ring gear with 96 teeth and 1 module is.

$$P_D = \frac{N_R}{M} \qquad \text{Eq. 03} \qquad P_D = \frac{96}{1} = 96mm$$

Pitch diameter of the planet gears must be found from.

$$P_{Dp} = \frac{N_R - P_{Ds}}{2} = \frac{96 - 24}{2} = \frac{72}{2} = 36mm$$

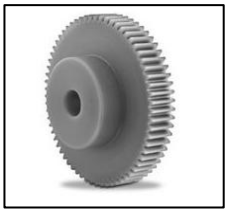
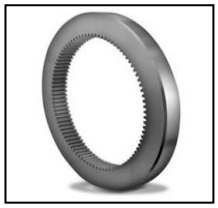
Number of teeth in the planet gears may now be found from.

$$P_{Dp} = \frac{N}{M} \qquad \text{Eq. 04} \qquad 36mm = \frac{N}{1} \rightarrow 36mm\ (1) = N \rightarrow \text{N =36 teeth}$$

Check:

$$R = 1 + \frac{N_R}{P_D} = 1 + \frac{96}{24} = 1 + 4 = 5$$

The ratio is 5:1, as design was required.

Gear Specs & Computed Data			
Unit: Metric (mm)			
	Sun Gear	**Planet Gear**	**Ring Gear**
QTY	**1**	**3**	**1**
Module	1	1	1
Teeth	24	36	96
Pressure Angle	20°	20°	20°
Pitch Dia.	24	36	96
Material	Nylon	Acetal	Steel
SDP/SI*	A 1Z 2MYZ1002408	A 1P 2MYH10036	A 1C10MYK10096
			
SDP/SI* www.sdp-si.com			