WEEK: 8

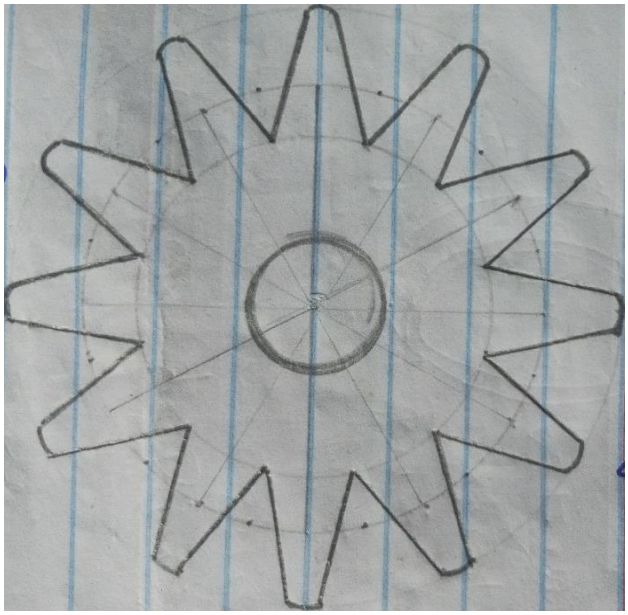
CLASS: JSS 3

DATE:

TOPIC: GEAR

GEAR

Gears are toothed members of an engineering system which transmits power/ motion between two or more shafts by meshing without any slip. A gear can also be defined as a toothed wheel used to transmit motion. Gear drives are also called positive drives. In any pair of gears, the smaller one is called pinion, while the larger one is called gear, immaterial of which is driving the other. When the pinion is the driver, the result is step down drive in which the output speed decreases and the torque increases. On the other hand, when the gear is the driver, it results in step up drive in which the output speed increases and the torque decreases.

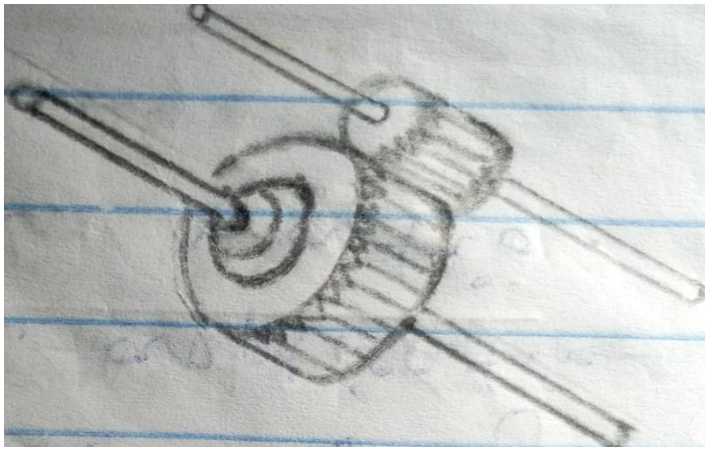


Types and classes of gears

The various types of gears are;

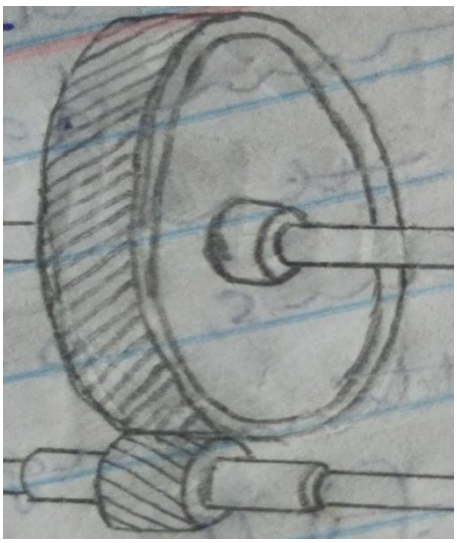
1. Spur gear
2. Internal and external gears
3. Helical gears
4. Herringbone gears
5. Rack and pinion
6. Bevel gears
7. Worm and worm gears etc.

Spur gear



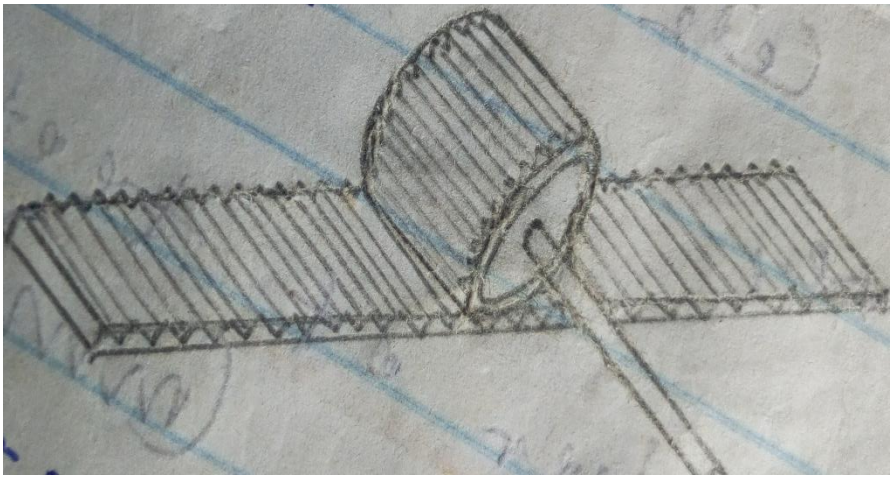
- Teeth are parallel to axis of rotation
- Transmit power from one shaft to another parallel shaft
- Used in electric screwdrivers, oscillating sprinkler, wind alarm clock, washing machine and cloth dryer.

Helical gear



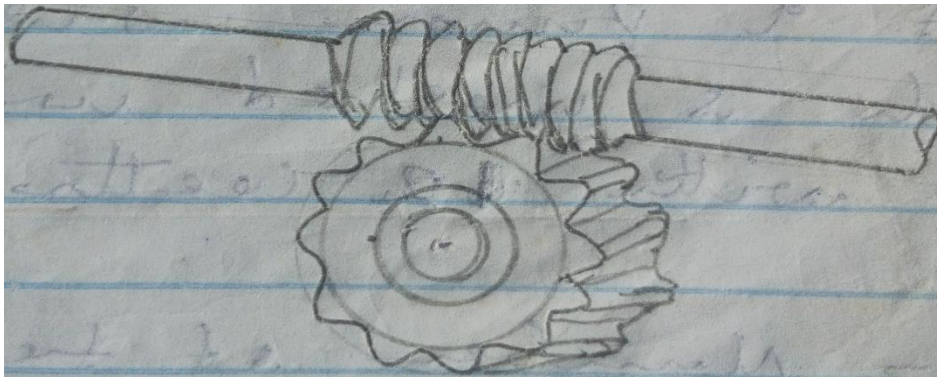
- The teeth on helical gears are cut at an angle to the face of the gear.
- The helical gear engages gradually which make it operate much more smoothly and quietly than other gears.
- Carries more load than equivalent sized spur gear.

Rack and pinion



- Rack and pinion are used to convert linear motion to rotary motion and the other way round.
- A perfect of example of this is the steering system of cars.

Worm and worm gear



- Worm gears are used where large gear production are needed.
- It is common for worm gears to have reductions of 20:1, even up to 300:1 or more.
- Many worm gears have an interesting property that no other gear set has; the worm can easily turn the gear, but the gear cannot turn the worm.
- Worm gears are used widely in material handling and transportation machinery, machine tools and automobiles etc.

Gear ratio and law of gearing

The fundamental law of gearing states that the angular velocity ratio between the gears of a gear set must remain constant throughout the mesh. This amounts to the following relationship:

$$\frac{\omega 1}{\omega 2} = \frac{n1}{n2} = \frac{d2}{d1} = \frac{z2}{z1}$$

Where;

	Pinion	**Gear**
Z= Number of teeth:	Z_1	Z_2
d= Diameter (mm):	d_1	d_2
n= Speed (rpm):	n_1	n_2
ω= Speed (rad/sec.)	ω_1	ω_2

Example

Calculate the number of teeth of a pinion with a speed of 20 rpm which is meshed with12 teeth.

Solution;

ZI = Number of teeth of pinion

Z2 = Number of teeth of gear

N1 = Speed of pinion

N2 = Speed of gear

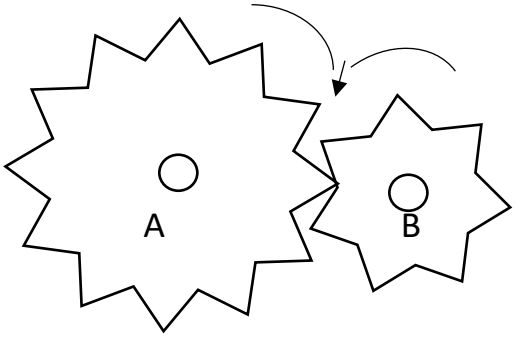
Using $\frac{n1}{n2} = \frac{z2}{z1}$

$$n1 = \frac{n2z2}{z1}$$

$$n1 = \frac{12X40}{20}$$

$$n1 = 24\ teeth.$$

Sketch of meshed gear and pinion



Assignment: Make a sketch of herringbone gear.