UNIT II

SPUR GEARS AND PARALLEL AXIS HELICAL GEARS

1. What are the advantages of using non-metallic gears?

The advantages of using non-metallic gears are,

Noiseless operation.

Low weight.

Corrosion free.

Damping of shocks and vibrations.

. What are the common profiles used for gear tooth?

The common profiles used for gear tooth are,

In volute.

Cycloidal.

3. What is backlash?

Backlash is defined as the play between a mating pair of gear teeth in assembled condition. It is the amount by .which the width of the tooth space exceeds -the thickness of the meshing. Tooth measured on pitch circle.

4. Explain under cutting in gears?

While generating -gear teeth, if there is interference of the cutter with the rotating job, then recess is cut at the root of the gear. Tooth, which is known as undercutting. This happens when the cutter extends beyond the base circle of the pinions having small number of teeth.

5. Give the requirements of gear materials?

Low cost Easy to manufacture. High strength. High wear resistance. Low coefficient of friction. 6. Compare cycloid and involutes profiles.

	INVOLUTE PROFILE	CYCLOD PROFILE
PRESSURE ANGLE	constant	
RUNNING	smooth	
MANUFACTURING	easy	
VELOCITY RATIO	Small variation in center distance does not affect velocity ratio.	Does not permit any variation in center distance.

7. What is interchangeability of gears?

In a gear drive, the ability of replacing a failed gear by a similar gear without affecting the functionality of the drive is called interchangeability of gears.

8. Define the pitch circle with reference to spur gear.

The imaginary diameter of the circle which allows pure rolling without slipping is known as pitch circle for the spur gear.

9. What are the general characteristics of spur gearing?

The general characteristics of spur gearing are,

Transmit torque between parallel shafts.

Teeth are parallel to axis.

Line contact takes place during mating.

Can be used as sliding gears in gearboxes.

Easy to design and manufacture.

10. When do you use non-metallic gears?

For reducing noise, non-metallic gears are used. Manufacturing cost of non-metallic gears is low. 11. State the advantages of the gear drives over other type of drives.

The advantages of the gear drives" over other types of drives over other types of drives are, Gear drives are positive drives.

Suitable for shorter centre distance.

The gear drives are better than others in case of amount of power transmission and efficiency.

Change of speed is very easy in gear drives.

12. What are the commonly used gear tooth systems?

The following four systems of gear tooth are commonly used in practice.

14.5degree composite system.

14.5degree full depth involutes system.

20 degree full depth system.

20 degree stub involutes system.

27. What are the advantages of toothed gears over other types of transmission system?

The advantages of toothed gears over other types of transmission system are,

Drive is compact.

High efficiency.

Constant velocity ratio.

Reliability in operation.

15. What are the applications's of spur gears?

The spur gears are used in sliding gearboxes, machine tools, automobiles, material handling equipments, rolling mills, marine Power plants, etc.

16. What is working depth of tooling gear tooth?

It is radial distance between the addendum and the dedendum . Circle of a gear. It is equal to the sum of addendum and duodenum.

17. What is tooth thickness of a spur gear?

It is the width of the tooth measured along the pitch circle.

18. Define seizure/scaring.

Under heavy load, the temperature of the lubricating oil rapidly rises and its viscosity falls. As a result, the oil film breaks and the teeth engage each other. Then as the gears rotate, softer particles are torn away from teeth, leaving scares and scratches on the surface.

19. How will you select the material for pinion teeth?

The teeth of pinion undergo more number of cycles than those of gear. This may cause quicker wear. The shape of pinion tooth gives lesser beam strength than that of gear tooth. Hence the material of the smaller wheel (pinion) should possess mechanical properties somewhat higher than the material of the mating gear.

20. Write the design procedure for non metallic gears.

Maximum permissible linear velocity for non-metallic gear is limited to 12 m/sec. Due to overheating, non-metallic pinions are usually run with cast iron gear. Pinion alone is designed in a gear pair with only beam strength checked. In general, for non-metallic materials $\sigma b = \sigma u/n$.

21. How will you design a gear when the material for gear and pinion are same?

If the materials for both pinion and gear are same, pinion alone is designed because pinion is weaker than gear. If different materials are used pinion is designed first and then both pinion and gear are cheeked.

22. What are the assumptions made in driving Lewis equation?

The assumptions are, Gear tooth is a cantilever with tip load. Only pair of teeth takes the entire load.

23. What is meant by stub tooth?

Stub tooth has shorter addendum and duodenum than the standard tooth. Hence stronger gear drive will be more compact.

37. Write the types of failures caused in a gear.

Tooth breakage. Surface failure. Abrasion. Seizure/scaring. Pitting.

23. Define transmission ratio with ratio with reference to spur gear.

Transmission of a spur gear defined as the ratio between number of teeth on a driver and number on driver.

Transmission ratio, $l = \frac{Z2}{Z1}$. Where,

Z2- Number of teeth on driven wheel. Z1- Number of teeth on driver on pinion.

24. What are the various materials used for the production of gears?

The materials used for production of gears are,

Metallic materials Plain carbon steels. Alloy steels. Cast iron. Bronze (Worm wheel) Non metallic materials Wood. Synthetic resins. Compressed papers. 25. State the advantages of involutes profile. The advantages of involutes profile are,

a) It allows slight alternations in center distance of two gears without change in velocity ratio.

b) Easy to manufacture by cutting or generating.

c) The pressure angle is constant along the profile.

26. Give the applications of cycloid gears.

Cycloidal gears are used in gear pumps and blowers. Clocks and watches and in certain of instruments in case where the question of interference and strength are prime considerations.

26. Define circular pitch.

This is the distance measured on the circumference of the pitch circle from a Point of one tooth to the corresponding point on the adjacent tooth. It is denoted by Pc'

$$Pc = \frac{\pi D}{N}$$

Where, D - Pitch circle dia of gear.

N – Number of teeth on the gear.

27. What are the advantages of cycloidal gearing?

The advantages of cycloidal gearing are,

Cycloidal tooth is stronger than involutetooth for the same pitch, as given more root area. Interface is inherently absent is cycloidal gearing.

27. What points must be considered while designing a gear drive?

The following points are considered for designing a gear drive.

Power to be transmitted.

Speed of the driver.

Velocity ratio.

Center distance.

28. What are favorable characteristics associated with internal gears.

The favorable characteristics associated with internal gears are,

Stronger tooth due to greater base width.

More teeth in contact.

Less sliding action and hence less wear.

Higher efficiency. Smoother operation,