

Secondary 4 Science and Technology

Automotive Transmission: Mechanical Engineering [Chapter 13]



<https://youtu.be/RQWejyx0gi8?t=2m30s>

- 1) a) Which one of the five types of motion transmission systems is used in the transmission system of a car?

Gear Train

- b) What are its advantages and disadvantages?

Advantages	Disadvantages
<ul style="list-style-type: none"> -Minimal Parts -Can change rotational direction by adding additional gears -Low friction reduces wear on parts -Can generate mechanical advantage 	<ul style="list-style-type: none"> -Only transmits over short distances -Must choose between quiet (helical teeth) or efficient (straight teeth)

- 2) a) The gear on the drive shaft* spins freely. What are the characteristics of the link between this gear and the drive shaft?

*The drive shaft is the rotating beam that connects the transmission system to the rear wheels.

Removable	Direct
Partial	Rigid

b) The clutch sleeve* on the drive shaft does not spin freely; when it turns the entire drive shaft turns with it. However, the clutch sleeve can slide along the drive shaft. What are the characteristics of the link between the clutch sleeve and the drive shaft?

*The clutch sleeve is a piece of metal that covers part of the drive shaft. It is the part that is moved when shifting gears

Removable	Direct
Complete	Rigid

3) The example in the video was of a very old transmission system. Modern cars tend to have seven gear positions (including neutral). In the following table fill in the missing information using what is given.

Gear	Engine (Driver) Gear Size	Driven Gear Size	Gear Ratio <u>Driver</u> Driven	Driven Direction (same or opposite)
1st	20 teeth	60 teeth	0.33	Same
2nd	20 teeth	40 teeth	0.5	Same
3rd	20 teeth	30 teeth	0.66	Same
4th	20 teeth	20 teeth	1.0	Same
5th	20 teeth	15 teeth	1.33	Same
Reverse	20 teeth	60 teeth	0.33	Opposite

4) a) What are the advantages of having different gear ratios available in an automobile transmission system?

- Allowing for speed changes
- Keep engine operating at most efficient speed (ex 2300 rpm)
- Exchange speed of rotation for rotational force (torque vs speed)
- Reduce wear on certain parts

b) What would happen if a vehicle got stuck in 5th gear and couldn't shift down?

If the vehicle slowed down it wouldn't be able to generate enough force to accelerate from low speeds or from a stop. Parts inside the car could be damaged as they are unable to turn the wheels.

c) What would happen if a vehicle was instead stuck in 1st gear?

The vehicle would be unable to accelerate to high speeds, the gear ratio would be far too low and the engine would need to increase its speed to compensate. The extra heat and rotational speed could damage the engine.