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# ANSWER BANK

## ELEMENT ONE

Demonstrate knowledge of final drives.

1. From the list provided identify the gear set shown in the diagram below. Please circle the appropriate gear.



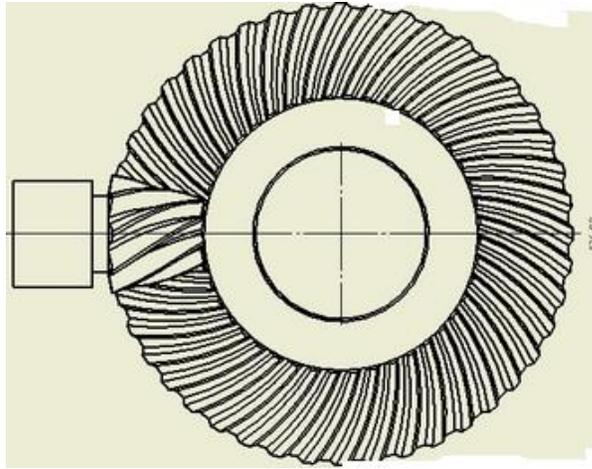
**Helical gear**

- 1b. From the list provided identify the gear set shown in the diagram below. Please circle the appropriate gear.



**Hypoid Bevel gear**

- 1c. From the list provided identify the gear set shown in the diagram below. Please circle the appropriate gear.



**Spiral bevel gear**

2. Name the gear sets described in the following paragraphs.

This design is commonly used in older vehicles and truck differentials where high torque is necessary.

Gear set: **Hypoid Bevel Gear**

This design is used in rear wheel drive applications. The centre line of the pinion is passing through the centre line of the crown wheel.

Gear set: **Spiral Bevel Gear**

This type of gear set is commonly used in front wheel drive applications.

Gear set: **Helical**

3. Why are helical gear sets commonly used in front wheel drive applications.

**They are used in Transverse engine front wheel drive vehicles as the direction of rotation is not required to be turned through 90 degrees.**

4. Give two advantages of using a Hypoid spiral gear set over other Spiral bevel gear sets.

**Any 2 of the following.**

- **Allows for a lower centre of gravity with improved vehicle handling.**
- **Reduces the intrusion of the drive shaft tunnel into the vehicle.**
- **Allows for the use of a larger diameter pinion gear for a given size crown wheel.**
- **Larger tooth contact area for a greater load capacity.**
- **Quieter operation.**
- **Lower gear ratios are available without resorting to two speed or double gearing, particularly useful in commercial vehicles.**

5. Which differential gear type is the noisier in operation and has less tooth contact than a hypoid gear.

**Spiral Bevel Gear.**

## ELEMENT TWO

Demonstrate knowledge of differential mechanisms.

1. **Why do vehicles require a differential.**

**Differentials transfer the drive from the driveshaft through 90 degrees to the road wheels. The drive is not only transmitted to 2 wheels but also allows these wheels to rotate at different speeds required when negotiating corners.**

2. **From the list provided match up LSD clutch type with its appropriate description:**

Passive

Hydraulic

Electronic

In this type of limited slip differential set up the differential clutch pack is locked by a spring when one wheel starts to spin or lose traction.

Gear set: **Passive**

In this type of limited slip differential set up the differential clutch pack is locked using an actuator and a pump when one wheel starts to spin or lose traction.

Gear set: **Hydraulic**

In this type of limited slip differential set up the differential clutch pack is locked when an ECU senses wheel spin or loss of traction.

Gear set: **Electronic**

3. **What is a cone clutch type limited slip differential.**

**A cone clutch is a type of limited slip differential that utilizes tapered cones machined on to both side gears to lock the drive axles to the differential carrier during loss of traction.**

4. **How many differentials are fitted to a passive four wheel drive vehicle.**

**Three**

5. What is a viscous fluid coupling and why are they used in some applications.

**A Viscous coupling type differential is a sealed type which contains a viscous silicon fluid that when heated expands and creates drive between a number of perforated drive plates which are splined to one axle and another set of plates which are splined to the carrier, and the other axle. The fluid is heated through friction that is created between the two different rotating shaft speeds. The resulting drive is an even spread of torque between the input and output shafts.**

6. Which is smoother in operation, a viscous fluid coupling differential or a gear type differential. Explain the reasons why.

**A Viscous coupling is smoother as power flow is slowly transferred to the slipping wheel as the silicon fluid expands within the sealed unit.**

7. **Describe the operation of the traction control system.**

Traction-control systems utilize the same wheel-speed sensors employed by the antilock braking system.

These sensors measure differences in rotational speed to determine if the wheels that are receiving power have lost traction. When the traction-control system determines that one wheel is spinning more quickly than the others, it automatically "pumps" the brake to that wheel to reduce its speed and lessen wheel slip. In most cases, individual wheel braking is enough to control wheel slip. However, some traction-control systems also reduce engine power to the slipping wheels.

**FINISHED? CHECK THAT YOU HAVE ATTEMPTED ALL QUESTIONS!**

**Assessor Comments:**