Components of Automobiles, Transmission system in vehicles.

Origin of the Automobile

- **Global Pioneer:** The first practical automobile was the **Benz Patent-Motorwagen** created by Karl Benz in 1886 in Germany.
- **Mass Production:** Henry Ford revolutionized the industry with the **Model T (1908)** and the moving assembly line, making cars affordable for the general public.
- **Arrival in India:** The first car landed in India in 1897. Initially, they were exclusive to royalty and wealthy elites.
- **Post-Independence Era:** The market was dominated by the **Hindustan Ambassador** and the **Premier Padmini** due to protectionist policies.
- **The Indian Revolution:** The **Maruti 800 (1983)** was the turning point, making car ownership a reality for the Indian middle class.

Major Components of Automobiles

- **Powertrain:** The system that generates and delivers power.
    - **Engine/Motor:** The power source.
    - **Transmission:** Manages speed and torque.
    - **Drivetrain:** Delivers power to the wheels (axles, driveshaft).
- **Chassis:** The vehicle's structural framework.
    - **Frame/Body:** The skeleton of the car.
    - **Suspension:** For ride comfort and handling.
    - **Steering & Brakes:** For control and safety.
- **Electrical System:** The car's nervous system.
    - **ECU (Electronic Control Unit):** The "brain" of the car.
    - **Battery, Alternator, Starter:** For starting and electrical power.
- **Body & Interior:** The parts you see and touch.
    - **Exterior Panels:** The outer shell.
    - **Interior Components:** Seats, dashboard, controls.
    - **Safety Systems:** Airbags, seatbelts.

Transmission System in Vehicles

- **Primary Purpose:** To manage the engine's speed (RPM) and rotational force (torque) to match different driving speeds efficiently.
- **Manual Transmission (MT):**
    - Driver uses a clutch pedal and gear lever to shift.
    - Pros: Cheap, engaging. Cons: Tiring in traffic.

- **Automatic Transmission (AT):**
    - Shifts gears automatically using a torque converter and planetary gears.
    - Pros: Smooth, easy to drive. Cons: Expensive.
- **Automated Manual Transmission (AMT):**
    - A manual gearbox with an automated clutch.
    - Pros: Low-cost automatic convenience. Cons: Can have jerky shifts.
- **Continuously Variable Transmission (CVT):**
    - Uses pulleys and a belt for seamless acceleration with no fixed gears.
    - Pros: Very smooth, fuel-efficient. Cons: "Droning" engine sound.
- **Dual-Clutch Transmission (DCT):**
    - Uses two clutches for extremely fast and efficient gear changes.
    - Pros: High performance. Cons: Very complex and expensive.

ECU Design for Mirror Control

- **Function:** A small computer that reads driver inputs to control the motors in the side-view mirrors.
- **Hardware Components:**
    - **Microcontroller:** The processing unit.
    - **Input Switches:** To select the mirror (Left/Right) and direction (Up/Down/Left/Right).
    - **H-Bridge:** A motor driver circuit to control the direction and power of the motors.
    - **DC Motors:** Small motors inside the mirror assembly.
- **Core Logic:**
    1. Read which mirror is selected.
    2. Read the desired direction from the joystick.
    3. Send the correct electrical signals via the H-Bridge to move the selected motor.