Don't care conditions are used in Karnaugh maps (K-maps) when certain input combinations will never occur or their output doesn’t matter in a digital system

1. you are designing a digital system to **encode a BCD (Binary Coded Decimal)** input. BCD only allows **decimal digits 0–9 , circuit takes a 4-bit BCD input (A, B, C, D) and outputs 1 if the number is less than or equal to 5, otherwise outputs 0.**

2. You are designing a control system for an elevator in a 3-floor building. The elevator has a 2-bit input to represent the current floor:
   Floor 0 → 00
   Floor 1 → 01
   Floor 2 → 10

3. You are designing a traffic light controller for a 3-way intersection. There are 3 sensors (inputs) that detect the presence of vehicles on each road:
   A – Sensor on Road A
   B – Sensor on Road B
   C – Sensor on Road C
   Each sensor outputs 1 if a vehicle is present and 0 if not.
   However, due to the layout of the intersection, certain sensor combinations are not physically possible. For example:
   All three roads cannot have cars at the same time (due to traffic flow restrictions).
   Also, no car at all (000) will turn the signal to flashing yellow, which is a separate case (not controlled here).