INSTRUCTIONS:
Fill out the hazard analysis and risk assessment below.
HA-001 should be for the lane departure warning function as discussed in the lecture.
HA-002 should be for the lane keeping assistance function as discussed in the lecture.
Then come up with your own situations and hazards for the lane assistance system. Fill in the HA-003 and HA-004 rows.
When finished, export your spreadsheet as a pdf file so that a reviewer can easily see your work.

Hazard ID	Situational Anal			
	Operational Mode	Operational Scenario	Environmental Details	Situation Details
HA-001	OM03 - Normal Driving	OS04 - Highway	EN06 - Rain (slippery road)	SD02 - High speed
HA-002	OM03 - Normal Driving	OS02 - City Road	EN01 - Normal conditions	SD01 - Low speed
HA-003	OM03 - Normal Driving	OS04 - Highway	EN03 - Fog (degraded view)	SD01 - Low speed
HA-004	OM03 - Normal Driving	OS03 - Country Road	EN01 - Normal conditions	SD02 - High speed

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Other Details (optional)	Item Usage (function)	Situation Description	Function
	IU01 - Correctly used	Normal driving on a highway during rain (slippery road) at high speed and correctly used system	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback
	IU01 - Correctly used	Normal driving on a city road during normal conditions at low speed and system used correctly	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane
	IU01 - Correctly used	Normal driving on a highway during foggy conditions at low speed and system used correctly	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback
	IU02 - Incorrectly used	Normal driving on a country road during normal conditions at high speed and system used incorrectly	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane

Hazard Identification			
Deviation	**Deviation Details**	**Hazardous Event (resulting effect)**	**Event Details**
DV04 - Actor effect is too much	The LDW function applies an oscillating torque with very high torque (above limit)	EV-02 - Side collision with other traffic	Vehicle operator loses control of steering wheel and vehicle turns into other traffic, resulting in injury to driver
DV01 - Function not activated	The LKA function is engaged but fails to apply steering torque to maintain ego lane	EV-06 - Front collision with oncoming traffic	Vehicle crashes into oncoming vehicle, resulting in injury to driver
DV03 - Function always activated	The LDW function applies an oscillating torque continuously when lane markers are undetectable, even while vehicle is centered within ego lane	EV-07 - None	Vehicle operator is able to maintain control of the steering wheel and immediately takes the vehicle to a service center
DV03 - Function always activated	The LKA function is always activated, allowing the vehicle operator to misuse it for autonomous driving	EV00 - Collision with other vehicle	Vehicle operator takes hands off the steering wheel and stops paying attention, resulting in a collision and injury to driver

Hazardous Event Description	Exposure (of situation)	Rationale (for exposure)	Severity (of potential harm)
Total loss of steering control of vehicle due to LDW malfunction	E3 - Medium probability	Moderate rainfall should be expected	S3 - Life-threatening or fatal injuries
Total loss of LKA function	E4 - High probability	City driving during normal conditions is common	S2 - Severe and life-threatening injuries
Continuous activation of LDW function	E1 - Very low probability	Fog dense enough to obstruct cameras' view of road is very rare	S0 - No injuries
Vehicle operator voluntarily relinquished control of the vehicle to the LKA function	E2 - Low probability	Driving on a country road while vehicle operator has let go of the steering wheel and stopped paying attentions should not occur often	S3 - Life-threatening or fatal injuries

Hazardous Event Classification			Determ
Rationale (for severity)	**Controllability (of hazardous event)**	**Rationale (for controllability)**	**ASIL Determination**
On highway speed of vehicle is expected to be high	C3 - Difficult to control or uncontrollable	Steering wheel oscillating too much to grip would be difficult to impossible to control	C
In city traffiic, speed of vehicle is expected to be low but impact with a vehicle moving in the opposite direction makes the collision more severe	C1 - Simply controllable	As long as the vehicle operator is paying attention, they should be able to determine that the LKA function is non-operational and manage steering on their own	A
LDW malfunction would be an annoyance to the driver but would not prevent them from operating the vehicle	C0 - Controllable in general	As long as the oscillating steering torque from the LDW function remained within set limits, the vehicle should be operational, despite the function being continuously activated	QM
On country roads speed of vehicle is expected to be high	C3 - Difficult to control or uncontrollable	Vehicle operator wouldn't react to potential hazards if they have taken their hands off the steering wheel and stopped paying attention to the road	B

ıination of ASIL and Safety Goals
Safety Goal
The oscillating steering torque from the LDW function shall be limited
Total loss of LKA function shall be prevented
Continuous activation of LDW function when lane markers are undetectable shall be prevented
The LKA function shall be time limited, and the additional steering torque shall end after a given time interval so that the driver cannot misuse the system for autonomous driving