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

When finished, export your spreadsheet as a pdf file so that a reviewer can easily see your

Hazard ID	Situational Ana			
	Operational Mode	Operational Scenario	Environmental Details	Situation Details
HA-001	OM03 - Normal Driving	OS01 - City Road	EN07-Snow (slippery road)	SD03 - High speed
HA-002	OM03 - Normal Driving	OS03 - Highway	EN02-Sun blares (degraded view)	SD03 - Low speed
HA-003	OM03 - Normal Driving	OS02 - Country Road	EN01 - Normal conditions	SD02 - High speed
HA-004	OM03 - Normal Driving	OS05-Mountain Pass	EN01 - Normal conditions	SD04 - High acceleration

the HA-003 and HA-004 rows.

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Other Details (optional)	Item Usage (function)	Situation Description	Function
N/A	IU01 - Correctly used	Normal Driving on City Road during Snow (slippery road) with High speed	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback
N/A	IU01 - Correctly used	Normal Driving on Highway Road during Sun Blares (degraded view) with low speed	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane
N/A	IU01 - Correctly used	Normal Driving on Country Road during Normal conditions with High Speed	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane
Curvy Road	IU01 - Correctly used	Normal Driving on Mountain Pass during Normal Conditions with High Acceleration	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	LDW applies torque with high magnitude and high frequency	Car spins out of control	Driver is not able to control the car on a slippery road and it spins out of control
DV19-Sensor detection is wrong	As sensor is not able to detect lanes correctly, it is not sending correct values to control	Car is not staying in lane	Car is not staying in lane as expected and hits another car as it crosses lane unexpectedly
DV04-Actor effect is too much	LKA applies too high value torque.	Car is not controllable at high speed on a country road.	Car goes out of control and hits vehicle coming from front.
DV05-Actor effect is too less	LKA applies too low value torque.	Car is not able to stay in lane.	Car exits lane and falls off the road.

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Hazardous Event Description	**Exposure (of situation)**	**Rationale (for exposure)**	**Severity (of potential harm)**
As road is slippery and car is driving at high speed, car goes out of control as high torque is applied at high frequency.	E2-Low Probability	This event is of low probability as not many people drive fast on city roads during snowy\slippery road	S3 - Life-threatening or fatal injuries
Car crosses the lane unexpectedly, hits another car and driver gets severe injury.	E1-Very low probability	It is very rare that there are Sun Blares and sensors are not working	S2 - Severe and life-threatening injuries
While driving at high speed on country road, car receives high value of torque to stay in lane and goes out of control and faces head on collision.	E3-Medium probability	This occurs often as people drive at high speeds on country roads.	S2 - Severe and life-threatening injuries
As it is Mountain Pass, high accelration on a curvy road and low torque to stay in lane results in car going off road and falls in a valley.	E2-Low Probability	It happens with only a few drivers who apply high accelration on a curvy road in a mountain pass.	S3 - Life-threatening or fatal injuries

dous Event Classification

Rationale (for severity)	Controllability (of hazardous event)	Rationale (for controllability)
Driving at high speed on a slippery city road can result in car spinning out of control resulting in Life threatening injuries	C3-Difficult to control or uncontrollable	Driving at high speed on slippery city road makes it difficult to control
As car is at low speed and others are also expected to be at low speed because of sun blares, it is expected that even though car hits other car\cars, the severity is low because of low speed.	C2-Normally controllable	As car is at low speed, driver should be able to control.
Head on collision at high speed will result in severe and life threatening injuries.	C3-Difficult to control or uncontrollable	As car is at high speed on a country road and receives high value of torque, it is difficult to control.
Car falling in a valley results in fatal injury.	C3-Difficult to control or uncontrollable	As it is a curvy mountainous road, it is difficult to control when high accelration is applied.

Determination of ASIL and Safety Goals	
ASIL Determination	**Safety Goal**
B	The osciallting torque should be limited.
QM	The Camera Sensor , ECU should figure out sensor malfunctioning and Lane Assistnce should deactivate and raise the alarm.
B	The Lane Assistance should apply controllable torque to stay in lane.
B	The Lane Assistance should apply appropriate torque to stay in lane.