Congratulations! You passed!

Grade received 100% | Latest Submission Grade 100% | To pass 80% or higher

Go to next item

1. Which from the below options is the most **ACCURATE** and **COMPLETE** definition of **risk** in terms of self-driving vehicles? 1 / 1 point

- Risk is any exposure to possible loss or injury
- Risk is a probability or threat of damage, injury, liability, loss, or any other negative occurrence that is caused by external or internal factors
- Risk is a probability that an event occurs combined with the severity of the harm that the event can cause
- Risk is a condition in which there is a possibility of an undesirable deviation from the desired or expected outcome
- None of the above

Correct

Correct: Any autonomous driving team should focus on the most likely and the most severe events first.

2. Which of the following are **major components** of an autonomous driving system? (Select all that apply) 1 / 1 point

- [x] Perception

Correct
Correct: This aspect of the autonomous driving system is extremely important. A mistake in this components can lead to failures and crashes.

- [x] Planning

Correct
Correct: This aspect of the autonomous driving system is extremely important. A mistake in this components can lead to failures and crashes.

- [ ] Adaptation
- [ ] Configuration
- [x] Control

Correct
Correct: This aspect of the autonomous driving system is extremely important. A mistake in this components can lead to failures and crashes.

3. What are the most common categories of autonomous vehicle **hazard sources**? (Select all that apply) 1 / 1 point

- [x] Hardware and software

Correct
Correct: This is a major hazard source.

- [x] Malicious software

Correct
Correct: This is a major hazard source.

- [x] Electrical and mechanical

Correct
Correct: This is a major hazard source.

- [x] Perception and planning

Correct
Correct: This is a major hazard source.

- [x] Driver inattention

Correct
Correct: This is a major hazard source.

4. Is the following statement TRUE or FALSE? 1 / 1 point

The safety framework to structure safety assessment for autonomous driving defined by NHTSA is **MANDATORY** to follow.

- (•) FALSE
- ( ) TRUE

Correct

Correct: NHTSA safety framework was released as a suggested, not mandatory to follow. The main objective of the NHTSA is to guide companies building self-driving cars without overly restricting innovation or pre-selecting technologies.

5. Which categories are included in the **safety framework** to structure safety assessment for autonomous driving defined by NHTSA? (Select all that apply) 1 / 1 point

- [x] Autonomy design

Correct
Correct: This is what any autonomous driving company should focus on according to NHTSA.

- [x] Testing and crash mitigation

Correct
Correct: This is what any autonomous driving company should focus on according to NHTSA.

- [x] Well-organized software development process

Correct
Correct: This is what any autonomous driving company should focus on according to NHTSA.

- [ ] Digital vehicle model design

6. Which actions are needed to be performed **in the event of an accident** by an autonomous vehicle? (Select all that apply) 1 / 1 point

- [x] Securing fuel pumps

Correct
Correct: Securing fuel pumps in the event of a crash is critical for preventing further potentially dangerous situations.

- [x] Returning car to a safe state

Correct
Correct: An autonomous vehicle's post crash behavior should include returning the car to a safe state, for example, stopping.

- [ ] Locking all doors
- [x] Alerting first responders

Correct
Correct: An autonomous vehicle should quickly alert first responders in the event of an accident.

- [x] Data recording to a black box

Correct
Correct: An autonomous vehicle needs to have an automated data recording function or black box recorder. It is very helpful to have this crash data to analyze and design systems that can avoid this specific kind of crash in the future.

7. What are the **most common** accident scenarios? (Select all that apply) 1 / 1 point

- [ ] Rollover
- [x] Lane change

Correct
Correct: All the correct accident scenarios from this question account for over 84% of all crashes.

- [x] Road departure

Correct
Correct: All the correct accident scenarios from this question account for over 84% of all crashes.

- [x] Intersection

Correct
Correct: All the correct accident scenarios from this question account for over 84% of all crashes.

- [x] Rear-end

Correct
Correct: All the correct accident scenarios from this question account for over 84% of all crashes.

- [ ] Crosswalk

8. What kind of **safety system** is described by the following definition? 1 / 1 point

This system can be analyzed to define quantifiable safety performance based on critical assessment of various scenarios.

- ( ) Data-driven safety
- ( ) Test-driven safety
- (•) Analytical safety
- ( ) None of the above

Correct

Correct: Analytical safety can provide strong guidance on which aspects of a system are the biggest contributors to overall safety.

9. According to the report by Rand Corporation, autonomous driving of 2.4 billion miles is required to demonstrate human-level fatality rate of an autonomous vehicle from using a 95% Confidence Interval. **How many years** is required to perform this testing with a fleet of 100 vehicles running 24 hours a day, 7 days a week at an average of 25 miles per hour? Your answer should be an integer. 1 / 1 point

440

Correct
Correct
8,800,000,000 miles / 100 vehicles = 88,000,000 miles per vehicle
88,000,000 miles / 25 miles per hr = 3,520,000 hrs per vehicle
24 hours * 365 days = 8,760 hrs in a year
3,520,000 hrs / 8,760 hrs in a year = 401.8 years
It would take at least 401 years to validate the required level of safety with a fleet of 100 vehicles traveling 24/7. That's why testing is being done today on thousands of vehicles simultaneously.

10. Given that an autonomous vehicle failure has happened and based on this tree, **what is the probability** that the failure happened because of Vehicle Control Algorithm Failure OR Inadequate Car Drivers? Please give your answer with the precision of 3 decimal places. 1 / 1 point

Please use this probabilistic fault tree for your computation:

0.392

Correct

Correct: The operations used to propagate the probabilities in probabilistic fault trees upwards are the same as the rules of probability when events follow set theory. So, the OR probabilities would be the sum of children node probabilities, assuming independence of the events.

11. Given that the autonomous vehicle failure has happened, and based on this tree, **what is the probability** that the failure happened because of Software Failure AND Extreme Weather Conditions at the same time? Please give your answer with the precision of 3 decimal places. 1 / 1 point

Please use the probabilistic fault tree from the previous question for your computation:

0.001

Correct

Correct: The operations used to propagate the probabilities in probabilistic fault trees upwards are the same as the rules of probability when events follow set theory. So, the AND probabilities would be the product of children node probabilities, assuming independence of the events.

12. A computer vision algorithm is responsible for extracting meaningful data from the onboard camera. A computer vision failure restricts the vehicle's ability to navigate the environment around it, hence a problem with this system is a serious failure. However, LiDAR and radar sense similar environment data, so a computer vision failure alone is not a critical system failure. A computer vision algorithm failure can be considered a semicritical service failure as it decreases vehicle sensing ability and is given a severity score of 5. This could happen regularly in rainy or foggy weather, so its occurrence is given a score of 7. A computer vision algorithm failure is fairly detectable in majority of the situations, so the detectability score is 3. 1 / 1 point

What is the risk priority number for a Computer vision algorithm failure according to FMEA and based on the description above? Your answer should be an integer.

35

Correct

Correct: The risk priority number is a product of the severity, frequency and detectability of an event. Each feature of the risk priority number is assessed on the scale from 1 to 10, where 10 is being the most severe, the most frequent and the most difficult to detect.

13. There are failures listed below. Which failures should we focus on **solving first** according to FMEA? 1 / 1 point

- (•) Vehicle driving onto a gravel road (risk priority score of 400)
- ( ) Vehicle motion prediction failure (risk priority score of 150)
- ( ) GPS synchronization failure (risk priority score of 300)
- ( ) Computer vision algorithm failure (risk priority score of 60)

Correct

Correct: The higher the risk priority score is, the higher priority of this failure is.

14. Which of the following options is the most **ACCURATE** and **COMPLETE** definition of **functional safety** in terms of self-driving vehicles? 1 / 1 point

- ( ) Functional safety is the process of avoiding unreasonable risk of harm to a living thing.
- (•) Functional safety is the detection of a potentially dangerous condition resulting in the activation of a protective or corrective device or mechanism to prevent hazardous events arising or providing mitigation to reduce the consequence of the hazardous event.
- ( ) Functional safety is a deterministic algorithm outlining the procedures that are carried out to prevent hazardous events from happening or minimizing the harm caused by hazardous events to the vehicle passengers and third parties involved in the situation
- ( ) Functional safety is a part of the vehicle operation management aimed to minimizing hazards, risks, accidents and near-misses
- ( ) None of the above

Correct

Correct

15. Which of the following standards defines **functional safety terms** and **activities for electrical and electronic systems** within motor vehicles? 1 / 1 point

- ( ) ISO/TC 204
- ( ) ISO 39001
- ( ) ISO/PAS 21448
- (•) ISO 26262
- ( ) None of the above

Correct

Correct: The ISO 26262 standard defines functional safety terms and activities for electrical and electronic systems within motor vehicles, and as such addresses the functions and software hazards that can affect autonomous vehicle safety.