
EE220 2019: SAMPLE ANSWERS

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QUESTION 1

5 MARKS EACH, RELATIVELY SHORT
ANSWERS

ANSWER ALL OF THE QUESTIONS

A : BRIEFLY DESCRIBE THE FOUR TYPES OF HUMAN OR OPERATOR INDUCED FAILURE AND IN A CASE OF LIABILITY, WHO WOULD BE RESPONSIBLE IN EACH CASE



Section 3: Slide 41



Skill based errors (Accidental) – We know what to do but we did the wrong thing

Product manufacturer



Rule-based errors (Intentional) – Failure to choose the right rule or violate rules

User



Knowledge based errors – We don't know what we are doing

This can be either the user or the manufacturer of the product (it would depend on the context)

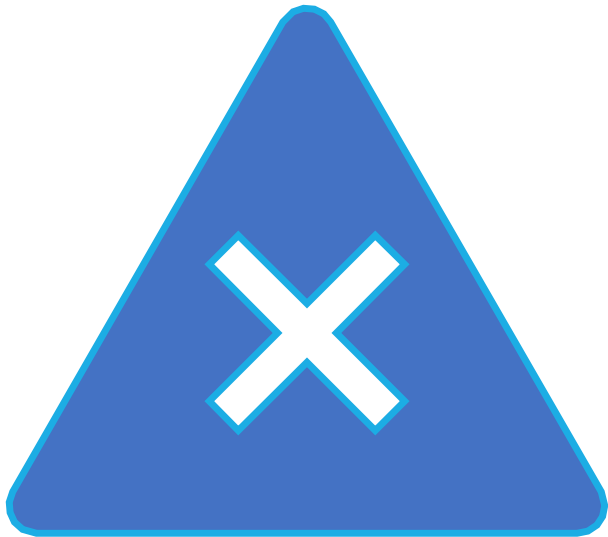


Judgement based errors – Excessive trust in the technology in the presence of failures

User

B: LIST AND EXPLAIN THE DIFFERENT FAULT MANAGEMENT STRATEGIES THAT SHOULD BE USED TO PREVENT FAILURE

- Section 3: Slide 43
- Avoid Faults – Use techniques that minimise the possibility of mistakes or errors
- Detect Faults – Use techniques that increase the possibility of detecting errors so that they can be corrected
- Tolerate Faults – Make sure that if there is a fault that the system cannot do something dangerous (fail-safe)
- Fault Forecasting – Can you know in the future when a product will fail?



C: EXPLAIN WHAT IS MEANT BY RESPONSIBILITY AND WHY IT IS IMPORTANT

- Responsibility is about being in control of something and being accountable for what that something is. If you are in control that means that it is your fault if something goes wrong and you must fix it.
- For example: When you are driving a car, you are responsible for the car. You must drive it properly, maintain the car, and if there is an accident you must make sure that the car is fixed. If the accident was your fault, you must pay for damages or maybe go to jail.
- Responsibility is important for knowing who is correct. If people / companies are responsible, their products will be of good quality, problems will be fixed quickly, and there will be a clear decision of who is liable if there is a failure.

D: EXPLAIN THE PRINCIPLE OF “PRINCIPLE OF ONTOGENY NON- DISCRIMINATION

- Do not panic, we did not cover this phrase in class. Therefore, this phrase will not be in your exam.
- Instead, we will discuss a related topic here: Moral status
- Section 6, Slide 20-25
- If something has moral status, it means that they have rights. There are certain things that you are not allowed to do to them because they count morally in their own right i.e. they are able to be moral because they can think and feel.
- For example: A rock has no moral status (it has no feelings, it cannot think, it is not able to be moral). Therefore, we can break a rock or crush it. However, we cannot do this to a human.
- At this point, a robot does not have moral status because it cannot think or feel and it cannot decide to be moral. It can only follow what the programmer has decided.

E: BRIEFLY EXPLAIN THE ISSUES AROUND TRAINING AND TRAINING DATA FOR THE DEVELOPMENT OF AUTONOMOUS SYSTEMS

- Good topics to choose are: Bias and Ethical views
- Section 6, Slides 2-4, Slides 31-33, Case study: COMPAS, IEEE Global Initiative
- Ethics can change depending on where you live. A person who lives in Europe might have a different view of ethics than a person from the USA. If a robot is programmed based on the ethics of Europe and will only be sold in Europe, this is okay. If a robot is made in Europe but will also be sold in America (or internationally) it is important to take into consideration different ethical views. This is why the IEEE global initiative is useful.
- It is difficult to find a human who does not have bias. A robot will follow the teachings of the programmer. If the programmer is biased it is possible that the robot will be the same. It is also possible that the data used to train an AI system might not be balanced and the system will learn to be biased in some way that is not obvious to the human. For example, the COMPAS system in the USA that seemed to give bigger penalties to people who were not white.

F: DISCUSS THE ISSUES AROUND “IF DRUNK, DO YOU HAVE THE LEGAL AUTHORITY TO AUTHORISE A SELF DRIVING CAR TO TAKE YOU HOME?”

- The answer to this question involves the difference between autonomous vehicles and semi-autonomous vehicles
- Section 4, parts 1, 2, and 3, Case study Elaine Herzberg
- If the car is semi-autonomous and it is the driver's legal responsibility to take control if something goes wrong or to monitor the car then the answer is no. Someone who has had alcohol is not able to fully control a car and cannot think correctly. For example, a distracted safety driver was not able to stop the death of Elaine Herzberg.
- If the car is autonomous and the manufacturer is liable (has accepted legal responsibility) for any accident, then it is possible to ask the car to take you home after drinking alcohol.
- However, it is difficult to decide if someone can take control of the car and make bad decisions. A law must be made by the government to be clear.

G: WHAT IS MEANT BY “EVENT DATA RECORDS” AND WHY ARE THEY CONSIDERED IMPORTANT?

- Section 5, parts 4 and 5
- Event data records are electronic records of things that happen in a system. For example, a ‘black box’ in a self driving car could store information like when the wheel was turned, what speed the car was driving at, the route that the car drove that day (like a more advanced dash-cam).
- Event data records are considered important because it will help to decide who is responsible if something bad happens. By looking at the stored information it could be possible to show who caused the failure / accident.
- These are important in areas where there is a high possibility for people to get hurt if something goes wrong like autonomous transport and medical robots,

H: EXPLAIN THE CHALLENGES IN ACHIEVING RELIABLE NEURAL INTERFACES.

- Section 9, Slides 11 – 14
- A neural interface is used to give an electrical signal to a nerve. Nerve bundles are very small and it is difficult to know which one needs to carry the signal.
- Using an epineurial electrode interface is not selective. It is designed to send the signal to every nerve that is near it. It can also damage the skin that it is placed on.
- A helicoidal electrode interface is wrapped around the nerve and does not do as much damage to the nearby skin. However, it is more difficult to implant into the person.



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- Deep stupidity is another way of saying Artificial Stupidity
 - Section 6, Slide 43 – 47
 - This is the idea that a machine might deliberately make mistakes to appear more human or that a machine can be deliberately confused. For example, if a human sees a road sign that someone has written on with paint the human will still understand the road sign. However, a robot might not. Criminals could use this to help them. If a criminal knows that an AI system is used to look for weapons in an airport, the criminal could design a weapon that looks like something else and the AI system would not recognise it.
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I: WHAT IS MEANT BY THE CONCEPT OF “DEEP STUPIDITY”?

J: EXPLAIN THE DIFFERENCES IN PERCEPTION FOR SMOOTH ROUND OBJECTS AND SHARP POINTY OBJECTS. WHAT IMPACT DOES THIS HAVE?

- Section 8, Slide 14
- Sharp and pointed things can be dangerous or could be used to hurt a human. When a human sees a thing like this, they can have a negative feeling toward it.
- Smooth round objects are not considered dangerous, so people have more positive feelings towards this. This is called contour bias.
- If you are designing a robot to be likeable it is better to design it to be smooth and round like BB-8. A robot with a sharp and pointed body would be considered scary.

**K: EXPLAIN THE
DIFFERENCE
BETWEEN
AUTONOMOUS
AND SEMI-
AUTONOMOUS
MACHINES.**

Section 5, Slide 3

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graph TD; A[Section 5, Slide 3] --> B[Autonomous robots do not need any external human input. They make decisions by themselves and work alone.]; B --> C[A semi-autonomous robot can recommend a decision to a human but the human must approve the decision. A semi-autonomous robot is supervised by a 'man in the middle'.];
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Autonomous robots do not need any external human input. They make decisions by themselves and work alone.

A semi-autonomous robot can recommend a decision to a human but the human must approve the decision. A semi-autonomous robot is supervised by a 'man in the middle'.

L: WHAT WAS THE REASON BEHIND THE LUDDITE MOVEMENT IN 18TH CENTURY ENGLAND?

- Section 1, Slide 24
- Companies wanted to use machines to make clothes instead of people. It was cheaper, faster, and safer to use the machines. The workers complained that the machines were not as skilled as they were and that the clothes would not be good quality.
- Many people lost their jobs and could not find new ones. They were hungry and angry so they decided to break the machines and hope that they could get their jobs back if there were no machines left.
- In this time, it was difficult to retrain or travel to find a new job.

QUESTION 2

WORTH 40 MARKS, LONG ESSAY STYLE
ANSWER IS REQUIRED

ANSWER ONE QUESTION

PART A

Key ideas:

- Changes from advances in intelligent devices
- Next twenty years
- Ethics
- Criminal Usage
- Employment

- On societal impact: Over the past two centuries, technology has created significant societal upheaval. In the coming decades, the capabilities of intelligent devices, mobile and static, are likely to create an unprecedented level of change in our society. Write an essay on the key changes that you will expect in the next twenty years, their impact, and the issues that will need to be addressed to ensure a minimum of negative change. As a hint, issues such as ethics, criminal usage, employment changes are topics that might be included in this essay, but many other issues are equally valid.

EXPAND THE KEY IDEAS

Next twenty years means
that the technology must
be very advanced or
already used in some
places

Possible changes in
intelligent devices in the
next twenty years:

Self driving cars

Home assistant robots

Telemedicine / AI
assisted medical
diagnosis

EXPAND THE KEY IDEAS

ethics

- How could our ethics change if these devices are used?
- Write a paragraph using each of the following topic statements.
 1. Do you think that these robots should be given moral status?
 2. Do you think that Explainable / Transparent AI is important to use with these robots?
 3. Is the IEEE global initiative important for these machines?

EXPAND THE KEY IDEAS

- Criminal Usage
- Write a paragraph using each of the following topic statements.
 1. Can these machines be used for criminal activities?
 2. Is privacy a problem with these machines? Personal data
 3. How could we prevent criminal usage?

EXPAND THE KEY IDEAS

- Employment
- Write a paragraph using each of the following topic statements.
 1. What jobs could be lost and why?
 2. How could people retrain to jobs that are close by?
 3. If people were replaced in these jobs, would you be worried?

**DON'T FORGET TO
INCLUDE THE
INTRODUCTION
AND CONCLUSION**



GUIDE FOR LENGTH OF WRITING

- The key idea on slides 18-20 should cover about 1 page each
 - Each of the numbered points under the key idea will cover about $\frac{1}{3}$ of a page
- The introduction should be about $\frac{1}{2}$ a page
- The conclusion should be about $\frac{1}{2}$ a page
- This gives a solid essay of 4 pages.
- If you have small or big handwriting, this page count could be 3 or 5 pages.