Spring 2025
End-sem Examination
Introduction to Philosophy of Technology

26th April, 2025 **Time: 3 hours**
Marks: 40

Section-A (Answer any 4 in about 300-400 words; keep your answers precise and to the point) **4 × 5**

1. **What is substance dualism? Provide any 2 arguments (a) for and (b) against substance dualism**

Substance dualism (1 mark; 0.5 marks each)

- The view that the universe consists of two kinds of stuff which are metaphysically distinct.
- There are material/physical substances on one hand, and on the other hand are immaterial/mental substances

Arguments for (2 marks; any two; 1 mark each; see if they have captured the essence of the argument)

Argument from religion
- according to religions that posit an afterlife, there exist eternal, immutable, and immaterial souls which are distinct yet equivalent to the body which perishes after death.

Argument from introspective appearance
- When I introspect – when I reflect on my mental life and consider the contents of my mental states – it doesn't seem to me that events in my mental life are physical events.
- My thinking of ice cream seems to me to be just that – thinking of ice cream. It doesn't seem at all to be an electrochemical discharge in my brain. It doesn't seem at all to be any kind of physical event. So my thinking of ice cream must be a non-physical event – mentality must be a non-physical phenomenon, in which case we are committed to substance dualism at the least.

Argument from essential properties
- there are essential differences between physical and mental objects. Physical objects are publicly accessible and extended in space, whereas the essential properties of minds are to think, they are accessible only privately, and are not extended in space.

Arguments against (2 marks; any two; 1 mark each)

Problem of other minds
- If minds are immaterial, then they are clearly not investigable by known empirical methods. Not only does this put minds beyond the scope of science, it also means that there is no way to know whether or not other people have minds

Ockham's Razor
- Ockham's razor posits that one must not expand their ontology beyond necessity, i.e., one should not postulate any more entities than are absolutely necessary to explain

the phenomena about which we are theorising. The dualist goes against this by postulating non-physical entities to explain the mind.

Problem of interaction

- The physical universe is held to be causally closed, which means that every physical effect has a physical cause. A physical effect brought about by a non-physical cause would contravene the first law of thermodynamics. The problem here for the Cartesian dualist is their contention that the non-physical mind is causally efficacious in the physical world, that the non-physical mind causes change in the physical body.

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2. **How is a people's history of science different from other dominant histories of science? Give any 2 examples of how modern science is built on the 'massive foundation created by humble labourers'?**

<u>Difference between people's history of science and dominant histories of science (2)</u>

- **Dominant histories of science (1 mark; 0.5 marks for each point)**
  - This history is made up of long periods of ignorance and confusion, punctuated once an age by the "Eureka!" of a brilliant thinker who puts it all together.
  - In this traditional heroic account, a few Great Men with Great Ideas tower over the rest of humanity, and it is to them that we owe science in its entirety.

- **People's history of science (1 mark; 0.5 marks for each point)**
  - a people's history of science aims to show how ordinary humans participated in creating science in profound ways. It is a history not only of the people but for the people and by the people as well
  - The central aim of a people's history of science is to demonstrate how a large number of anonymous masses of humble people contributed greatly to the production and propagation of scientific knowledge than has been recognized.

<u>2 examples of how modern science is built on the foundation by humble labourers (3 marks; 1.5 + 1.5; look for any two of the below domains)</u>

- **Food production (look for any 2 points; 1 mark for the first; 0.5 for any additional point)**
  - Virtually every plant and animal species we eat today was domesticated by experimentation and de facto genetic engineering practiced by preliterate ancient peoples.
  - We are infinitely more in debt to pre-Columbian Amerindians than to modern plant geneticists for the scientific knowledge underlying food production.
  - Even in relatively recent times, when American plantation owners wanted to grow rice, they found themselves compelled to buy African slaves with knowledge of the ecology of rice plants
- **Medicine (same as above)**
  - the science of medicine began with and continues to draw on knowledge of plants' therapeutic properties discovered by prehistoric peoples.

- Amerindians demonstrated to Europeans the efficacy of the bark of the cinchona tree in treating malaria, and an African slave named Onesimus introduced the practice of inoculation against smallpox to North America.
- Credit for the discovery of vaccination that usually goes to Dr. Edward Jenner belongs instead to a farmer named Benjamin Jesty.
- Furthermore, until the nineteenth century the advance of medical science owed more to semiliterate barber-surgeons, apothecaries, and "irregular" healers than to university-trained medical scholars, whose influence tended to retard the acquisition of new medical knowledge.
- It was a Swiss pig-gelder named Jakob Nufer who in the 1580s performed the first recorded cesarean section.

- **Geography and cartography (same as above)**
  - The geography and cartography of the Americas and the Pacific Ocean are founded on the knowledge of the native peoples. Captain John Smith acknowledged that his celebrated map of the Chesapeake Bay area "was had by information of the Savages," and Captain Cook's maps of the Pacific Islands were derived from information given to him by an indigenous navigator named Tupaia.
  - Anonymous sailors and fishermen were the original source of scientific data regarding tides, ocean currents, and prevailing winds; when Benjamin Franklin produced the first chart of the Gulf Stream, he acknowledged that it was entirely based on what he had learned from "simple" whalers.

- **Chemistry, metallurgy, and materials science (same as above)**
  - Chemistry, metallurgy, and the materials sciences in general originated in knowledge produced by ancient miners, smiths, and potters.
  - Mathematics owes its existence and a great deal of its development to surveyors, merchants, clerk-accountants, and mechanics of many millennia.
  - And finally, the empirical method that characterized the Scientific Revolution of the sixteenth and seventeenth centuries, as well as the mass of scientific data on which it built, emerged from the workshops of European artisans.

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3. **What are the social barriers that mark the distinction between scientific elite and the people who are the subject of Conner's history?**

<u>0.5 marks for a general point about scientific elite vs. the people:</u>
What defined members of the scientific elite is not the blueness of their blood (their status by birth) but their status of professional intellectuals. The social

<u>Social barriers that mark the distinction between scientific elite and the people (4.5 marks; 1.5 marks each; look not only for the label but also for outlining the description for each; 0.5 for label + 1 for description)</u>

- **working with hands**
  - there has been a sharply defined social barrier based on the distinction between manual and intellectual work. People who work with their hands have long been looked down upon as inferiors by those who make their livings without getting their hands dirty

- **Literacy and knowledge of Latin**
  - literacy meant not merely knowing how to read and write, but being able to do so in Latin. Knowledge of the Latin language was the skill that alone distinguished the learned from the vulgar, the elite from the popular.
- **Anonymity/lack of patronage (it's ok if they break this into two points and describe each)**
  - The names of many university-trained scholars who earned a place in scientific history are immortalized by their published writings, but the names of most illiterate and semiliterate artisans are usually recorded, if at all, only in birth, baptismal, marriage, and death records that give no clue as to their role in the creation of natural knowledge. Because of their anonymity, they were thus not given any patronage in terms of funding, resources, etc.

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4. **How does Searle distinguish between strong AI and weak AI?**
   Why according to John Searle does strong AI:
   (a) display dualism in a strong form and
   (b) is the last gasp of an 'antiscientific tradition'

Strong vs. weak AI (1+1; 2 marks)

Strong AI (any one of below points)

- The position that a machine can have a mental state, such as understanding, in virtue of instantiation of a computer program.
- All there is to the mind is a program.
  - Alternatively, Mind : Brain : : software : hardware
- to be a mind is to instantiate a computer program that passes the Turing test

Weak AI

- is the more cautious approach that one can use computer models to study the human mind

(a) Strong AI as dualism in a strong form (1.5; 1 mark for the first; 0.5 for any second/supporting points; look for 2 points in total)

- strong AI displays dualism in a strong form, according to Searle, because unless one accepts the idea that the mind is completely independent of the brain or any other physical system, one could not possibly hope to create minds just by designing programs.
- Since strong AI is based on the independence of the mind and the brain (or since the mental is independent of the physical, it displays dualism in a strong form.

(b) strong AI as the last gasp of an antiscientific tradition (1.5; same as above)

- Since the mind, according to strong AI, is independent of the human brain, it is a computer program and as such has no essential connection to any specific hardware. Strong AI denies that there is anything essentially physical about the human mind.
- Scientific tradition on the other hand has succeeded since it investigated into actual physically existing things and their causes and effects.

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5. **What is the trolley problem and what does it illustrate about human reasoning? What are the various requirements for reasoning about morality in humans and machines?**

Trolley problem (3; make sure they put all the broad plot points of the scenario in place)
You are driving a **speeding trolley** down a set of tracks, and just ahead you see five workers standing together in the middle of the tracks. You step on the brakes, but you find that they don't work. Fortunately, there is a **spur** of tracks leading off to the right. You can steer the trolley onto the spur and **avoid hitting the five workers**. Unfortunately, there is a **single worker** standing in the middle of the spur. If you **do nothing, the trolley will drive straight into the five workers** and kill them all. If you **steer the trolley to the right, the trolley will kill the single worker.** What is the moral thing to do?

What it illustrates about human reasoning (1 mark)

- The trolley problem illustrates that human reasoning about moral dilemmas is very sensitive to the way in which the dilemmas are presented/framed.

Requirements for reasoning about morality (1 mark; look for any one point)

- Reasoning about morality requires one to recognize cause-and-effect relationships, to imagine different possible futures, to have a sense of the beliefs and goals of others, and to predict the likely outcomes of one's actions in whatever situation one finds oneself.
- In other words, a prerequisite to trustworthy moral reasoning is general common sense, which, as we've seen, is missing in even the best of today's AI systems.

Section B (Answer both questions: Each in about 500-700 words): 2 × 10

6. **Explain the Chinese room argument by outlining the axioms that Searle puts forward and the conclusions he draws therefrom.**

   How and why does Searle's response to (a) differ from that to (b):

   where (a) refers to 'is the brain's mind a computer program?'
   and (b) refers to 'can a machine think?'

   Describe any 2 objections to Searle's argument along with his reply to these objections.

CRA in terms of axioms and conclusions (5 marks; their answers need not be exact matches; look for whether they've got the gist of it right; 3 marks for getting all 4 axioms + 0.5 marks for getting Conclusion 1 + 0.5 marks for Conclusion 2 + 1 mark those who have written all 4 axioms and all 4 conclusions in the right order)

Axiom 1: Computer programs are formal (syntactic)

Axiom 2: Human minds have mental contents (semantics)

Axiom 3: Syntax by itself is neither constitutive of nor sufficient for semantics

Conclusion 1: Programs are neither constitutive of nor sufficient for minds

Axiom 4: Brains cause minds

Conclusion 2: Any other system capable of causing minds would have to have causal powers (at least) equivalent to those of brains

Conclusion 3: Any artefact that produced mental phenomena, any artificial brain, would have to be able to duplicate the specific causal powers of brains, and it could not do that just by running a formal program

Conclusion 4: The way that human brains actually produce mental phenomena cannot be solely by virtue of running a computer program.

(a) vs. (b) where (a) refers to 'is the brain's mind a computer program?' and (b) refers to 'can a machine think?' (0.5 marks each; total 1 mark; they need to give a brief explanation, not just say yes/no)

- Searle's reply to (a) is NO, the brain's mind is not a computer program, and this is because of the Chinese room argument.
- Whereas Searle's reply to (b) is YES a machine can think, if by machine we mean a physical system capable of performing certain functions, and our brain is just such a machine.

Any 2 objections and Searle's replies (4 marks; 1 mark for each objection + 1 mark for Searle's reply)

1. Systems objection

Searle's thought experiment wrongly focuses all our attention on the person in the room, who clearly doesn't genuinely understand Chinese. But there's more to the computer than just "that person": rather, there is a whole system in place, a system consisting of that person but also of the symbols, and of course the rule book containing the "program" specifying which symbols should be output. And it's the system as a whole, including the rule book, that
understands Chinese.

Searle's response:

Imagine that you are in the room and have memorized the rule book and all the symbols. You now are the system, you have internalized it, everything in the system is now in you. What you know how to do is send out certain squiggles when certain squoggles come in.
You pass the Turing Test—your responses are like those of a native speaker. Except that you still don't understand Chinese. And why not? Because you're still just dealing with formal symbols. What's lacking is the meaning, the semantics, essential to true mentality. So even the "system as a whole" doesn't understand Chinese.

2. Robot objection:

Rather than the system of the Chinese room, a more realistic system would include the ability to move around in the world, perform various tasks, and so on. In short, we should consider a computer program that operates a robot—a device that could successfully navigate the world as a human being does. That system would, if passing the Turing Test for its behavior, count as having a genuine mind.

Searle's response:
Imagine you're back in the Chinese room, manipulating those meaningless squiggles. But now unbeknownst to you, some of those incoming symbols are generated by television cameras attached to a robot's "eyes," and some of your outgoing symbols move robotic arms and legs in various ways. Imagine, in other words, that the Chinese room simply is navigating a robot through the world. Yet you still don't understand a word of Chinese. So even a system hooked up to a robot wouldn't have genuine mentality.

Other possible objections:
See p. 29 of Searle's essay, "is the brain's mind a computer program?" (pts. (a)-(g))

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7. **What is the barrier of meaning in AI? What constitutes the building blocks of understanding according to Melanie Mitchell? What is Barsalou's 'understanding as simulation' hypothesis and how does Lakoff and Johnson's thesis on metaphors support Barsalou's hypothesis?**
   What could be the implications of all this for 'strong AI' in the context of Searle's Chinese room argument?

Barrier of meaning (1; look for any 2 points; 0.5 marks each)
- Barrier of meaning has to do with the barrier of understanding between humans and AI.
- How to make AI understand the situations they encounter like the way humans do.
- AI systems lack a grasp of the rich meanings humans bring to bear in perception, language, and reasoning.

Building blocks of understanding (3; 1 mark each; look for any 3; figure 44 refers to the figure in Melanie Mitchell, p. 286; some of them might refer to this)
- the building blocks of understanding comprises the most **basic common sense** that we are born with or learn early in life.
  - For example, even very young babies know that the world is divided into objects, that the parts of an object tend to move together, and if portions of an object are hidden from view (for example, the feet of the man crossing behind the stroller in figure 44), they remain part of the object.
- **intuitive physics**
  - As infants, we humans learn quite a lot about how objects behave in the world, knowledge that as adults we take entirely for granted and are barely conscious of even having. If you push an object, it will move unless it is too heavy or blocked by something else; if you drop an object, it will fall, and it will stop, bounce, or possibly break when it hits the ground; if you put a smaller object behind a larger object, the smaller object will be hidden
- **intuitive biology**
  - knowledge about how living things differ from inanimate objects. For example, any young child would understand that, unlike the stroller, the dog in figure 44 can move (or refuse to move) of its own accord. We intuitively comprehend that like us the dog cansee and hear, and that it is directing its nose to the ground in order to smell something
- **intuitive psychology**
  - ability to sense and predict the feelings, beliefs, and goals of other people. For example, you recognize that the woman in figure 44 wants to cross the street with her baby and dog intact, that she doesn't know the man crossing in the opposite direction, that she is not frightened of the man, that her attention is currently on her phone conversation, that

she expects cars to stop for her, and that she would be surprised and frightened if she noticed your car getting too close

Barsalou's understanding as simulation hypothesis (look for any 2 of the underlined aspects; 1 mark each; total 2 marks)

- Barsalou's understanding as simulation hypothesis claims that our understanding of the situations we encounter consists in our (subconsciously) performing mental simulations on top of mental models which are representations of how the world works, based on our knowledge of physical and biological facts, cause and effect, and human behavior.
- Not only do your mental models allow you to predict what is likely to happen in a given situation; these models also let you imagine what would happen if particular events were to occur.

Lakoff and Johnson's thesis (1; any one point)

- Lakoff and Johnson's thesis is that not only is our everyday language absolutely teeming with metaphors that are often invisible to us, but our understanding of essentially all abstract concepts comes about via metaphors based on core physical knowledge.
- We conceptualize abstract concepts such as time, love, sadness, anger, and poverty in terms of concrete physical concepts.

How it supports Barsalou's hypothesis (1 mark for any one of the below points)

- Lakoff and Johnson's show that we conceptualize abstract concepts such as time, love, sadness, anger, and poverty in terms of concrete physical concepts.
- Lakoff and Johnson note that we talk about the abstract concept of time using terms that apply to the more concrete concept of money. You "spend" or "save" time. You often "don't have enough time to spend."Sometimes the time you spend is "worth it," and you have "used your time profitably." You might know someone who is living on "borrowed time."
- we conceptualize emotional states such as happiness and sadness as physical directions—up and down. I might be "feeling down" and could "fall into a depression." My mood might be "quickly dropping." My friends often "give my spirits a lift" and leave me in "high spirits."
- we often conceptualize social interactions in terms of physical temperature. "I was given a warm welcome." "She gave me an icy stare." "He gave me the cold shoulder."
- Elevator experiment:

  One group of researchers noted that the same brain area seems to be activated whether a person thinks about physical warmth or social warmth.

Implications of the above for Searle's CRA (2; 1 mark for trying to join the dots between the two; 1 mark for their own take on it; there is no right or wrong answer here; give 1 mark as grace regardless)

- see how they connect the understanding as simulation hypothesis (Barsalou) and conceptualization of abstract concepts in terms of physical concepts (Lakoff and Johnson) to Searle's argument.
