

Exercises

1	2	3
---	---	---

Surname, First name

CS-234 Technologies for democratic society 24/25 (CS-234)

Exam 31 Jan 2025

1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0

a b c d e f → b

a b c d e f → a

b c d e f → c

c d e f → d

Answer multiple-choice questions as shown in the example.

1. **DO NOT OPEN** the exam until you are told to do so. This is a **closed-book** exam.
2. This exam consists of **29 multiple choice questions, 6 short answer questions, and 2 essay prompts.**
3. **Only answer 1 out of the 2** exam prompts. If you start a 2nd essay, only the first one will be graded.
4. We prefer that your answers are written in **English**.
5. Use a **black or dark blue** ballpen and clearly erase with **correction fluid**.
6. Answer the questions **on your own. No collaboration**.
7. You **may not** use any outside materials or electronic devices.
8. Illegible answers will **not be** corrected nor graded.

MULTIPLE CHOICE QUESTIONS

1p **1a** What does Dahl mean by "enlightened understanding" as a criterion for a democratic process?

- a The ability of citizens to delegate their decisions to more knowledgeable representatives.
- b The inclusion of only the most educated citizens in the decision-making process.
- c The requirement that all policies must be explained in technical detail to all voters.
- d The provision of adequate opportunities for citizens to learn about and understand the implications of policy choices.

1p **1b** Which factor does Thomas Piketty identify as a key driver of rising inequality in his theory?

- a Globalization and free trade
- b Widespread adoption of technology
- c The rate of return on capital exceeding the rate of economic growth
- d Changes in government tax policies

1p **1c** What principle explains why higher-ranked search results receive more clicks and attention than lower-ranked results?

- a Semantic Ranking Bias
- b Digital Bandwagon Effect
- c PageRank Effect
- d Primacy Effect

1p **1d** What does Duverger's Law suggest about electoral systems using plurality voting?

- a They encourage the development of multi-party systems.
- b They ensure minority representation in elections.
- c They lead to the dominance of two major political parties.
- d They tend to result in proportional representation.

1p **1e** What is meant by the phrase “code is law” in the context of The DAO?

- a A principle that ensures code can always be overridden by legal authorities.
- b The requirement that developers adhere strictly to government-regulated coding standards.
- c A belief that only legal systems can determine the outcomes of blockchain-based governance
- d The idea that software code governs actions and decisions in a way that replaces traditional legal systems.

1p **1f** How does Google Votes minimize bias in the voting process?

- a By limiting the number of votes cast on each issue.
- b By presenting options in a per-user random order and hiding results until the issue closes.
- c By allowing users to vote anonymously on all issues.
- d By assigning votes to predetermined categories based on user behavior.

1p **1g** What does the study on LiquiFeedback reveal about the voting alignment between delegates and their voters?

- a Delegates avoid voting when their preferences differ from their voters.
- b Delegates often vote differently from their voters, exercising independent decision-making.
- c Delegates consistently vote the same way as their voters.
- d Delegates vote in favor of proposals only when a quorum is reached.

1p **1h** Which of the following voting systems eliminates candidates with the fewest first-place votes in successive rounds?

- a Coombs Voting
- b Approval Voting
- c Single Transferable Vote
- d Runoff Voting

1p **1i** Which of the following is **NOT** a characteristic of deliberative polling?

- a Informed and informative.
- b **Focused solely on individual rumination.**
- c Comprehensive, addressing all major points of view.
- d Balanced with a tradeoff between deliberation and political equality.

1p **1j** Which of the following was a key finding about the crowdsourced law reform process in Finland?

- a It was primarily a mechanism for collecting statistical data.
- b **It provided evidence of democratic deliberation despite self-selection.**
- c It lacked any form of inclusiveness or diversity of viewpoints.
- d It relied entirely on financial incentives for participation.

1p **1k** What is the role of computational puzzles in resisting Sybil attacks?

- a To enhance redundancy in identity verification
- b To increase the speed of communication.
- c **To prove the computation resource commitment of an entity.**
- d To establish centralized identity management.

1p **1l** What is a drawback of using crowdsourcing to detect social bots (i.e., using legions of workers to detect social bots by human efforts)?

- a It is ineffective against simple social bots
- b **It exposes sensitive user information to third parties.**
- c It has a high false-positive rate.
- d It cannot handle real-time detection.

1p **1m** What is the primary impact of ephemerality on /b/'s community dynamics?

- a **It encourages the rapid iteration and reposting of content.**
- b It fosters long-term discussion threads.
- c It decreases user participation.
- d It creates a sense of permanence and accountability.

1p **1n** What is the primary goal of a Self-Sovereign Identity (SSI) system?

- a To enhance government surveillance capabilities.
- b To centralize user data for easier management
- c To replace encryption in authentication processes.
- d **To give individuals full control over their digital identities.**

1p **1o** Which method does the Idena Network use to achieve Sybil-resistance?

- a Intersectional web of trust.
- b Quadratic voting systems.
- c **AI-hard reverse Turing tests (FLIPs) with elements of a virtual pseudonym party**
- d Token Curated Registry.

1p **1p** What is the main concept of "information gerrymandering"?

- a **Structuring influence networks to bias collective decisions.**
- b Restricting voter turnout through targeted misinformation.
- c Encouraging voter apathy with overly complex information.
- d Manipulating election outcomes through vote tampering.

1p **1q** How do zealot bots influence the outcomes in the voter game?

- a By always supporting their party regardless of the poll data.
- b By continuously switching their votes to create deadlock.
- c By neutralizing the impact of influence assortment.
- d By generating randomized votes to confuse other players.

1p **1r** What is the primary research question explored in the audit of YouTube radicalization pathways?

- a The existence of a radicalization pipeline steering users toward extreme content.
- b The effectiveness of YouTube's algorithms in recommending diverse content.
- c The growth of political channels on YouTube.
- d The impact of monetization policies on content creation.

1p **1s** What is the main purpose of introducing internet voting in Switzerland?

- a To replace postal voting entirely.
- b To address low voter turnout and improve voting convenience.
- c To experiment with blockchain voting systems.
- d To centralize voting procedures under federal governance.

1p **1t** What trend was observed in the reciprocity of delegations over time in the German Pirate Party's LiquidFeedback system?

- a Reciprocity increased as delegation chains grew longer.
- b Reciprocity decreased as delegations became concentrated among supervoters.
- c Reciprocity was inversely proportional to the number of users.
- d Reciprocity remained constant throughout the observation period.

1p **1u** What does the term "crowdsourced deliberation" refer to?

- a Exclusive policymaking by expert committees.
- b **Asynchronous, open, depersonalized, and distributed online deliberation.**
- c Anonymous voting on policy drafts.
- d Direct decision-making by online participants.

1p **1v** Why are assistant professors more likely to feel obligated to add honorary authors?

- a They are under less pressure to publish than senior academics.
- b They lack the experience to understand publication norms.
- c They are required to collaborate on all publications as per academic policy.
- d **They often depend on senior colleagues for career advancement and fear the consequences of refusal.**

1p **1w** What is the main ethical concern surrounding citation cartels?

- a **They unfairly manipulate journal rankings by inflating citation counts.**
- b They impose strict citation guidelines on authors.
- c They create barriers for early-career researchers to get published.
- d They obscure the originality of research by promoting older studies.

1p **1x** What is the role of pseudonym parties in Proof of Personhood systems?

- a To replace AI-hard tests in identity validation.
- b **To create verifiable connections between online identities and real-world individuals.**
- c To ensure only individuals with financial stake can join the network.
- d To automate identity verification through machine learning.

1p **1y** In what way does Quadratic Voting attempt to improve over one-person-one-vote (1p1v) scheme?

- a It requires fewer resources to implement compared to traditional voting systems.
- b **It allows voters to express the intensity of their preferences, leading to Pareto-improving outcomes.**
- c It eliminates the need for a central decision-making authority.
- d It reduces the influence of wealth inequality in democratic systems.

1p **1z** What practical challenges are associated with implementing Quadratic Voting?

- a The difficulty in educating voters about the quadratic cost structure.
- b The potential for collusion and the need for large-scale experiments to validate its effectiveness.
- c The intended reliance on real money, which could exacerbate wealth inequality.
- d **All of the above.**

1p **1aa** Why were Swiss citizens living abroad a primary target group for internet voting trials?

- a **Postal voting posed logistical challenges for them.**
- b They were already using e-government services.
- c Their voter turnout rates were consistently high.
- d They were more familiar with online technologies.

1p **1ab** What does the term "Condorcet Winner" mean in voting systems?

- a A candidate who receives more than 50% of the total votes.
- b A candidate ranked first by the majority of voters.
- c A candidate with the highest total score in a Borda count.
- d **A candidate who defeats every other candidate in head-to-head matchups.**

SHORT ANSWER QUESTIONS

2p 2a Name and briefly describe in one sentence: (i) a way in which social media has been or could legitimately be called “democratizing” and; (ii) a way in which social media decisively fails to satisfy Robert Dahl’s principles of democracy.

3p **2b** In single-winner elections, it is commonly believed that *Approval Voting* tends to favor electing more moderate or “centrist” candidates, whereas *Runoff* or *Instant Runoff Voting (IRV)* can favor more “extremist” candidates. Briefly describe an election scenario illustrating when this might happen.

4p 2c What is a *prediction market*? Briefly state the concept and give an example. Why do prediction markets often make good predictions? Then state one situation in which prediction markets might be ineffective.

3p 2d Briefly explain the fundamental difference between biometric *authentication* mechanisms, such as the face or fingerprint recognition mechanisms common in today's smartphones, and biometric *identity* systems like India's Aadhaar or Worldcoin, which use biometrics for Sybil resistance. Name two ways in which the security, privacy, and/or reliability challenges are more difficult in biometric identity systems than in biometric authentication.

3p **2e** Name three ways in which websites often try to prevent people from signing up for multiple (perhaps many) accounts on the site, and one way in which each of these measures can fail to provide that protection.

2p 2f State two potential social benefits that UseNet was widely perceived to provide while it was popular, and two social disadvantages or weaknesses it exhibited in the way people were ultimately found to use it.

ESSAY

Please choose ONE of the following two essay topics to answer.

Your essay should be as **clear** and **comprehensive** yet **concise** as possible. It should cover the most important "key points" - discussing the relevant issues, and synthesizing the knowledge of the topic you have acquired throughout the course. In particular, your answers should incorporate the understanding you acquired through lectures, discussions, assigned readings, and homework assignments.

We expect a response of approximately **500 words**.

Essay #1: Throughout the semester, we have examined a range of digital tools—Usenet, HotCRP, Ethereum, and Loomio—to explore democratic principles in practice. Now, suggest another digital tool—real or imaginary—that could be used to further deepen one's understanding of the principles of a democratic society. In your response, **draw on** the ideas you have synthesized from assigned readings, and class discussions, while explicitly referring to them. Finally, briefly describe how this tool might be integrated in a course like CS-234 to give students hands-on experience with the tool and the democratic principles it attempts to incorporate.

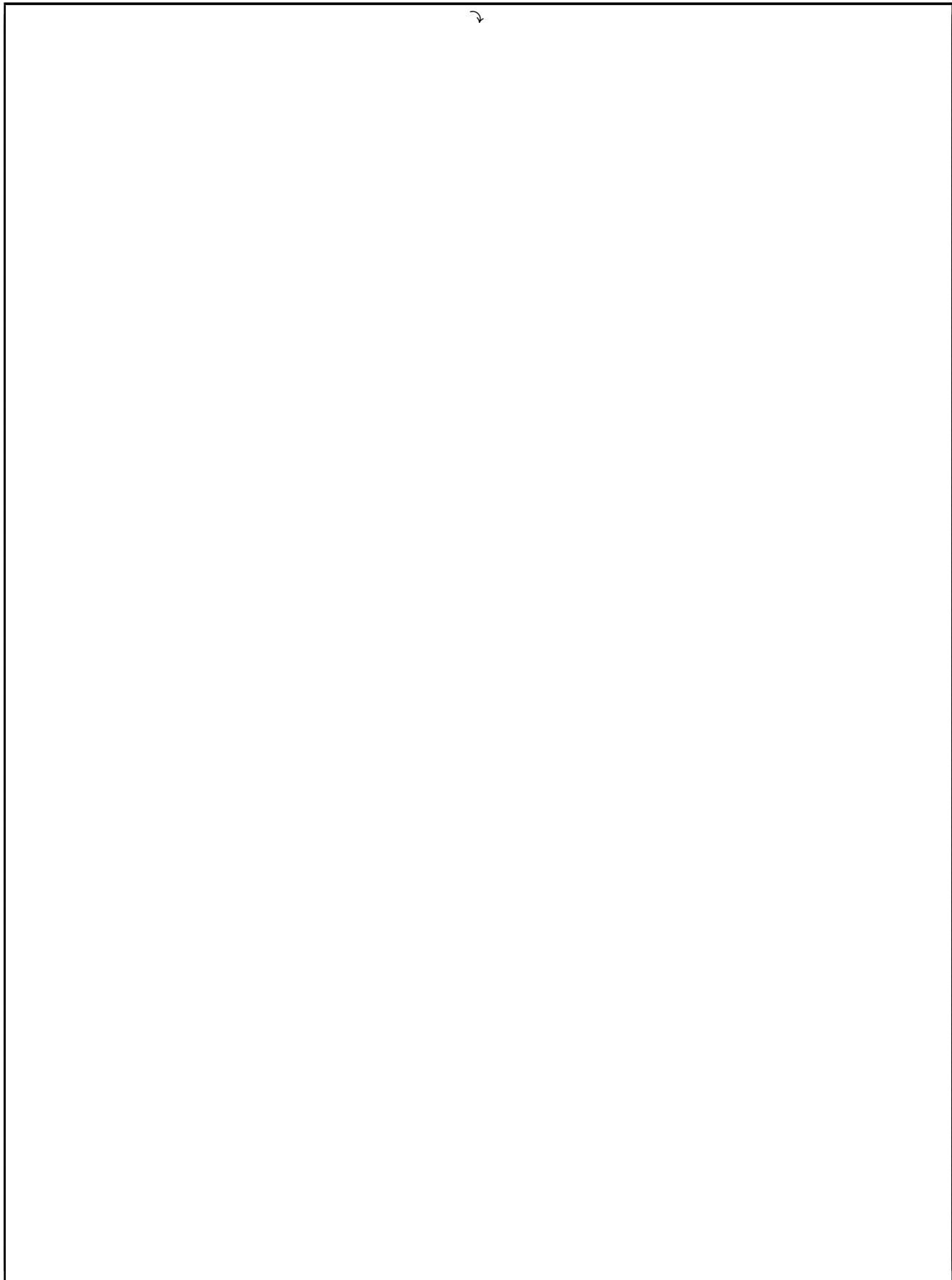
Essay #2: Your family has been running a business for a long time and it has been thriving even in the e-commerce age. However, recently, you have observed that your company has been receiving fewer requests while your competitors have started to catch up. Your father, the former CEO of the company, suspects that your competitors might be using search engine optimization techniques to lower your website's index. You analyze this to find that it was indeed the case! In your response, draw on the illustration from the "*Worst Practices in Search Engine Optimization*" paper and describe **four** possible techniques that your competitors might have used to achieve this goal. As a computer scientist turned CEO, propose possible ways to tackle these issues. These ways could be either something that you as the service provider could utilize or even some ways the search engines should be adapted to.

3a Brainstorm Session

Utilize the remaining space on this page and the subsequent full page to organize your thoughts.

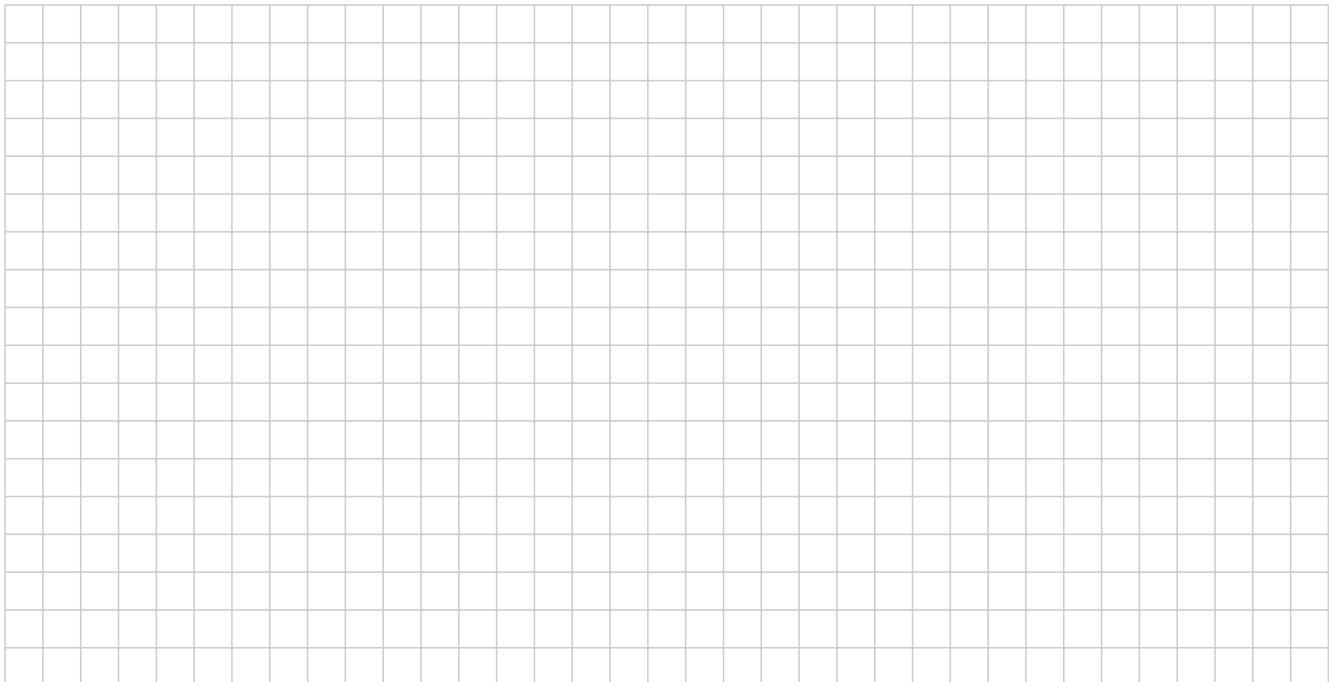
Consider jotting down key ideas, concepts, or arguments that will support your essay.

Do NOT write your essay here. Your essay should start on page 14.



3b Diagrams

If helpful, you may **draw diagrams** in the designated box below. Please ensure that all diagrams are **properly labeled**. You are encouraged to **refer to your diagram(s)** within your essay to support your arguments. However, your essay **must remain understandable without** the diagram.

**20p 3c Essay**

Write your in-depth essay of about 500 words below, while specifying the essay number below.
Essay #_____

