

INSTRUCTIONS: PLEASE READ CAREFULLY

- This exam has 5 questions, numbered 1 to 5, with subquestions.
- In Question 1 you should choose three, and only three subquestions.
- In Questions 4 and 5, you should choose one, and only one subquestion.
- This is a closed book exam.
- Please have your ID ready to be checked.
- The invigilator will not answer any queries during the exam. If you have a question that does not allow you to proceed with the answer, write down the assumption or assumptions that you deem necessary, in order to proceed.
- **Communication between students, access to any written material, or to tablets and mobile phones is strictly prohibited during the exam. Failure to comply with this rule results in failing the course and is considered a serious breach of academic honesty. It will be duly communicated to the competent School authorities.**
- The exam lasts 3h. The suggested time for completion is indicated in each question. It totals 150 minutes, allowing you a 30-minute slack.

Good Luck!

1. (3 points, 15 minutes) Give a brief definition of three of the following concepts. Feel free to complement your definition with an example.
 - (a) Condorcet winner.
 - (b) Samuelson Rule of optimal public good provision.
 - (c) The counterfactual.
 - (d) Randomised controlled trials.
 - (e) Nudge.
2. (4.5 points, 35 minutes) The municipality of Lisbon is deciding whether or not to build a new bridge over the Tagus river. There are two types of bridge users: the commuters who cross it during weekdays, for work, and the weekend travellers who use it for leisure time. There are 10 000 commuters, and each derives a marginal benefit from the bridge of 5 €. The weekend travellers are 2 000, and each derives a marginal benefit of using the bridge of 3 €.
 - (a) Is the bridge a pure public good? Discuss.
 - (b) The bridge costs €53 000. Should the municipality build it?

- (c) If the bridge costs €40 000 instead, discuss the likelihood that the commuters will create an association and build the bridge with private funding.
3. (6 points, 50 minutes) The municipality of Lisbon is deciding whether or not to build a new bridge over the Tagus river. There is a single type of users of the bridge, the commuters who cross it to work. The mayor hired an economics consulting firm that estimated the following. Each commuter would save 30 minutes, on average, in each direction, from using the bridge, when compared with the alternative commuting by train. The one-way train ticket costs 2.5 €. The total cost of using the car, including gasoline and the car's depreciation, amounts to 5 € per trip (i.e., one way). The average commuter receives a monthly wage of €1600 and works 160 hours on an average month.
- (a) Explain briefly how you would use the information above to estimate the average commuter's marginal willingness to pay for the bridge. Give your answer on a per day basis.
- (b) The opposition claims that the mayor should not use this estimate to decide about the bridge construction, because there is a social cost of using the car which is not taken into account by the commuters. Do you agree? Explain, using the appropriate economic concepts.
- (c) An environmental expert estimates that the marginal social damage of using the car is 1.5 € per one-way trip. Suggest one possible solution for the commuters to take the marginal social cost of using the car into account when deciding their transportation mode.

Make sure you only answer 4(a) or 4(b), and 5(a) or 5(b)

4. (3 points, 20 minutes) Choose one of the questions below to answer.
- (a) Recently, there has been a movement of youth towards persuading politicians that more environmental protection is needed. The founder of this movement is Greta Thunberg, a Swedish 15-year old. Is there a case for arguing that decreasing the minimum voting age would improve the governments investment in environmental protection? Discuss, referring to the median voter result and to how environmental concerns should depend on one's age for the result to hold. You may, but need not, use a graph of the benefit from environmental protection to sustain your answer.
- (b) An international law firm has 5 Italian lawyers, 5 Portuguese, and 5 of other nationalities. They are considering buying a new coffee machine for the office, and have looked at three different alternatives. The first is a traditional Italian coffee maker, the second a barista type of espresso coffee maker, and the third a nespresso type. Call them t, b, n. The Italian workers prefer t, the Portuguese prefer b, while all the others would rather have n. All the workers in the firm say that if they cannot have their preferred option, they are indifferent between any of the other two.
- i. Plot the preferences for the different options of the three groups. Discuss whether or not they are single-peaked.
- ii. Suppose that the workers toss a coin to decide their vote when indifferent. Show that all three options are Condorcet winners in this case.

5. (3.5 points, 30 minutes) Choose one of the quotes below to comment, highlighting the economic concepts that help understanding it. Limit your answer to 20 lines.

(a) The following is a quote from the May 23rd, 2019 edition of the Financial Times. Comment the sentence. Make sure you explicitly use the concepts of externality and lobbying in your answer.

“The Trump administration has been hit with an environmental lawsuit, on average, once every five days since taking power in January 2017. Almost every time President Donald Trump has tried to implement his environmental agenda centred on boosting fossil fuels and cutting regulations lawsuits have followed. In recent months, efforts to open offshore drilling, launch the Keystone XL pipeline or support coal mining have all been thwarted by legal challenges. “We sued the Obama administration, we sued the Clinton administration, we sued Bush Two, Bush One... But not once every 11 days,” says Mitchell Bernard, chief counsel at the Natural Resources Defense Council, a non-profit group whose lawyers have filed more than 80 legal actions against the administration. He adds that environmental litigation in the Trump era is “different both in degree and kind” from anything he has ever seen.”

(b) The following is a quote from The Independent (January 27, 2019). Discuss the concept of “nudge” and whether you expect the default enrolment to be the cause of increased retirement savings.

Glossary: An *occupational pension scheme* is a private pension savings account that is connected to one’s job, i.e., you typically contribute a given, pre-determined, share of your wage to the savings account. To *opt out* means to unregister from a contract or commitment.

“In 2012 the [UK] government introduced a ‘nudge’ to encourage people to save for their retirement. Rather than relying on workers to sign up to occupational pension schemes, the legal default became that everyone gets enrolled unless they deliberately opt out. (...) The result has been a surge in retirement saving, with the number of active pension scheme members up from 8 million in 2012 to 15 million in 2017.”