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Department of Economics

The exam consists of 2 parts. Each part consists of a number of subquestions. Start by reading through the whole exam, and make sure that you allocate time to answering questions you find easy. You can get a good grade even if there are parts of problems that you do not have time to solve. Please write clearly. Unreadable answers will get no points.

Part 1 (Microeconomics)

1. Firm J produces an output y with two inputs: labor of Ann, denoted ℓ_A, and labor of Bob, denoted ℓ_B. The production function is:

$$\phi(\ell_A, \ell_B) = 4(\ell_A + \ell_B) - 1$$

   a. Does the firm satisfy possibility of inaction? Briefly justify.

   b. Show (graphically or algebraically) that the production function satisfies "increasing returns to scale".

   c. Determine the cost function of the firm.

2. Ann has the following preferences over consumption, denoted c_A, and leisure time, denoted t_A:

$$(c_A, t_A) \succsim (c_A', t_A') \Leftrightarrow c_A t_A \geq c_A' t_A'$$

   a. Show that $u(c_A, t_A) = (c_A)^{\frac{1}{2}} (t_A)^{\frac{1}{2}}$ is a function that represents Ann's preferences.

   b. Determine the Walrasian demands of the two commodities (consumption and leisure).

   c. Determine the Hicksian demands of the two commodities.

   d. What type of commodities are consumption and leisure for Ann: normal, inferior, Giffen, complements, and/or substitutes? Briefly justify your answer.

Part 2 (Pirate politics)

There are 5 rational pirates, A, B, C, D and E. They find 100 gold coins. They must decide how to distribute them and coins cannot be cut into pieces.

The pirates have a strict order of seniority: A is superior to B, who is superior to C, who is superior to D, who is superior to E.

The pirate world's rules of distribution are thus: that the most senior pirate proposes a distribution of coins. The pirates, including the proposer, then vote on whether to accept this distribution. If the proposed allocation is approved <u>by a majority or a tie vote</u>, it happens. If not, the proposer is thrown overboard from the pirate ship and eaten by sharks (payoff -∞), and the next most senior pirate makes a new proposal to begin the system again.

Pirates base their decisions on three factors. First of all, each pirate wants to survive. Second, given survival, each pirate wants to maximize the number of gold coins he receives. Third, each pirate would prefer to throw another overboard, i.e. a pirate, in evaluating outcomes which give him an identical number of coins will strictly prefer the alternative which implies throwing someone else overboard.

The pirates do not trust each other, and will neither make nor honor any promises between pirates apart from the main proposal

a) Define or describe in words what a Subgame Perfect Nash Equilibrium (SPNE) is.

b) Define or describe in words what backward induction is.

c) If the pirate game ever reaches the stage where Pirate D gets to propose, which other pirate(s) will be left on the ship? Show that D's proposal will be to take all the coins for himself. How will the remaining pirate(s) on board vote?

d) Given your answer in part c), solve the rest of the game with backward induction.