UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Exam: **ECON4271 – Distributive Justice and Economic Inequality**

Date of exam: Wednesday, May 10, 2017 **Grades are given:** June 2, 2017

Time for exam: 2.30 p.m. – 5.30 p.m.

The problem set covers 4 pages (incl. cover sheet)

Resources allowed:

- No written or printed resources – or calculator - is allowed (except if you have been granted use of a dictionary from the Faculty of Social Sciences)

The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

Exam ECON4271 : Distributive Justice and Economic Inequality

The exam consists of four parts, which are divided into several questions. Each part carries the percentage weight indicated. Each question whithin each part carries the same weight. Start by reading through the whole exam, and make sure that you allocate time to answering problems you find easy. You can get a good grade even if there are parts of problems that you do not have time to solve.

1. PART 1: 30%. Samuelson (1977) discusses the problem of allocating 100 chocolates between two individuals, say 1 and 2. The goal is to define social preferences over all distributions of chocolates $x \equiv (x_1, x_2) \in \mathbb{R}^2_+$. Individuals care only about their selves and prefer more chocolate to less. Their indices of well-being are $u_1(x_1) = 2x_1$ and $u_2(x_2) = 3x_2$; depending on the axioms, these indices may be "utility functions" with cardinal and interpersonally comparable meaning.

   (a) What is the implication of *strong Pareto* on social preferences?

   (b) Assume social preferences can be represented by $W(x) = g_1(u_1) + g_2(u_2)$ with g_1 and g_2 continuous and increasing. What is the implication of the *Pigou-Dalton transfer principle* on g_1 and g_2?
   [Hint: the *Pigou-Dalton transfer principle* says that for any two distributions $x, \bar{x} \in \mathbb{R}^2_+$ such that $x_1 = \bar{x}_1 - \Delta > \bar{x}_2 + \Delta = x_2$, society prefers x to $\bar{x}$]

   (c) Write an example of social preferences that satisfy *minimal equity*.
   [Hint: *minimal equity* says that for any two distributions $x, \bar{x} \in \mathbb{R}^2_+$ such that $u_1(\bar{x}_1) > u_1(x_1) > u_2(x_2) > u_2(\bar{x}_2)$, society prefers x to $\bar{x}$]

   (d) Rank the following allocations using the above two axioms: $x = (55, 45)$ and $\bar{x} = (50, 50)$.

   (e) What is the relationship between the *Pigou-Dalton transfer principle* and *minimal equity*?

   (f) Samuelson's example violates the universal domain assumption of Arrow's impossibility result. What welfare criterion satisfies Arrow's remaining axioms when preferences of individuals are single-peaked (even with 3 or more individuals)?

2. PART 2: 25%.

   (a) Are second-degree stochastic and second-degree inverse stochastic dominance different or equivalent criteria? Justify your answer.

   (b) Define the primal and dual measures of inequality and explain the difference between primal and dual inequality measures. Explain how the primal and dual social welfare functions can be used to justify the primal and dual families of inequality measure.

   (c) Explain what conditions second-degree Lorenz dominance imposes on the family of dual measures of inequality and why similar conditions cannot be found for the primal measures of inequality.

3. PART 3: 25%. Consider the question of how to rank infinite streams of well-being by means of a reflexive and binary social welfare relation (SWR) $\succsim$.

   An SWR satisfies the *Strong Pareto* (SP) axiom if

   $$(x_1, x_2, \dots, x_t, \dots) \succ (y_1, y_2, \dots, y_t, \dots)$$

   whenever $x_t \geq y_t$ for all t and $x_{t'} > y_{t'}$ for some t'. An SWR satisfies the *Weak Pareto* (WP) axiom if

   $$(x_1, x_2, \dots, x_t, \dots) \succ (y_1, y_2, \dots, y_t, \dots)$$

   whenever $x_t > y_t$ for all t.

   An SWR satisfies the *Strong Anonymity* (SA) axiom if $(x_1, x_2, \dots, x_t, \dots)$ is equally good as any re-order of the elements in $(x_1, x_2, \dots, x_t, \dots)$. An SWR satisfies the *Finite Anonymity* (FA) axiom if $(x_1, x_2, \dots, x_t, \dots)$ is equally good as any re-order of the elements in $(x_1, x_2, \dots, x_t, \dots)$ where only a finite number of elements change position.

   (a) Why does SP imply WP, and why does SA imply FA?

   (b) Show by means of a counter-example that no SWR can satisfy both SP and SA.

   (c) There are several results showing that no *complete* SWR can satisfy both WP and FA when some additional requirement is imposed. Mention one of these results.

   (d) The *time-discounted utilitarian* (TDU) SWR is represented by the social welfare function:

   $$W(x_1, x_2, \dots, x_t, \dots) = (1 - \beta) \sum_{t=1}^{\infty} \beta^{t-1} u(x_t),$$

   where u is a continuous and increasing function that transforms well-being into (generalized) utility, and β is a utility discount factor between 0 and 1. Is the TDU SWR complete? Which of the axioms SP, WP, SA and FA does the TDU SWR satisfy (explaining why for the axioms it satisfies and providing a counter-example for the axioms it does not satisfy).

(e) The *maximin* SWR is represented by the social welfare function:

$$W(x_1, x_2, \dots, x_t, \dots) \; = \; \inf_{t \geq 1} x_t \, .$$

Is the maximin SWR complete? Which of the axioms SP, WP, SA and FA does the maximin SWR satisfy (again explaining why for the axioms it satisfies and providing a counter-example for the axioms it does not satisfy).

4. PART 4: 20%.

   (a) Discuss some factors that can explain why there is inequality in labor earnings among ordinary wage earners in many Western countries over the last decades. Pay particular attention to separating between sources coming from the country itself and factors that are due to changes in international factors.

   (b) Discuss why it is not straightforward to empirically investigate the effect of international trade on wages and inequality. How do Autor et al. (2013) manage to estimate the effect on inequality from imports from China?

   (c) What has been the evolution of top incomes (the highest 1 % or 0.1 %) over the last decades in Western countries? What can explain this evolution?