Ph.D. (Economics) Entrance Exam Sample Paper

Disclaimer: The sample questions below are only meant to provide an idea about the possible type of questions that might be asked in the entrance examination. These questions are not meant to provide any suggestions regarding the difficulty level of the actual entrance examination or the topics going to be covered therein.

Question 1

In a Prisoners' Dilemma game played between player 1 and player 2, it is common knowledge that player 1 is rational but the type of player 2 is private information. Let player 1's prior probability belief of player 2 being rational be q, $0 < q < 1$, while with probability $1\text{-}q$ player 2 is crazy. Then it is optimal for player 1 to

a) Cooperate if $q < 1/2$
b) Defect if $q < 1/2$
c) Cooperate with probability q
d) Defect with probability 1

Question 2

Consider a static long run depiction of the economy where the production function, consumption function and the investment function are given as follows:

$$Y = K^{\alpha}L^{1-\alpha}$$
$$C = C_0 + b(Y - T)$$
$$I = I_0 - dr$$

Government spending (G) and taxes (T) are exogenous in this economy. Furthermore, remember that since the economy is already in the long run, prices are flexible. Suppose government spending increases. What happens to investment (I) and the real interest rate (r) in this economy?

a) r increases and I decrease
b) r decreases and I increase
c) Both r and I decrease
d) None of the above

Question 3

Suppose you are interested in examining the relationship between graduating college and parental income. Assume *college* in the equation below is a dummy variable which takes 1 if individual i graduates from college, and 0 otherwise. You estimate the following regression equation by OLS and find that $\widehat{\beta_1}$ =0.35 with standard error of the estimate=0.1.

$$\text{college}_i = \beta_0 + \beta_1 \log(parental\ income)_i + u_i$$

Based on the above estimate, all else constant, an increase in parental income by 10% would lead to:

a. No effect on the probability of graduating college.
b. Increase in the probability of college graduation by 3.5/100 percentage points.
c. Increase in the probability of college graduation by 3.5 percentage points.
d. None of the above.

Question 4

There are three voters who have to elect one of three candidates a, b and c. Each voter votes for one of the candidates. The candidate who wins the most number of votes wins; in case of a tie, a is elected. Each voter has a utility function where having her best, second-best and worst outcomes elected gives her payoffs of 1, 0.5 and 0 respectively. Suppose voter 1's best, second-best and worst outcomes are a, b and c, respectively. Voter 2's best, second-best and worst outcomes are b, c and a, respectively. Voter 3's best, second-best and worst outcomes are c, a and b, respectively.

Which of the following is true?

a) Voting for b is a weakly dominant strategy for voter 1.
b) Voting for b is a weakly dominant strategy for voter 2.
c) Voting for a is a weakly dominant strategy for voter 3.
d) None of the above.

Question 5

We want to find out the effect of girls getting a Bachelors degree on their income. We run the following regression:

$$y_i = \beta_0 + \beta_1 female_i + \beta_2 BA_i + \beta_3 female_i * BA_i + \varepsilon_i$$

Where female is a dummy variable which takes the value 1 if female, 0 otherwise and BA is a dummy variable that takes the value 1 if individual i has a Bachelors or above degree and zero otherwise. y is the income of individual and ε_i is the error term. Let $\widehat{\beta_0}, \widehat{\beta_1}, \widehat{\beta_2}$ and $\widehat{\beta_3}$ be the estimated coefficients. The average income of the men without Bachelors degrees is equal to:

a. $\widehat{\beta_1} + \widehat{\beta_3}$
b. $\widehat{\beta_0}$
c. Insufficient information provided to calculate
d. $\widehat{\beta_0} + \widehat{\beta_1} + \widehat{\beta_2} + \widehat{\beta_3}$

Question 6

Consider an infinite horizon dynamic heterogeneous agent consumption-savings problem. The agents differ by a labor income shock (s) that reflects on their wages. s can take two values $\{s_H, s_L\}$. The agents can save using a risk-free asset (k). The rate of return on this asset (r) and the wage rate in the economy (w) are constant. However, wage income, defined by (ws) differ across agents because of the shock s every period. Some people in the economy get s_H while others receive s_L in a given period. This difference also shows up in their consumption savings decisions as well. The above description implies a budget constraint for the i^{th} agent in time t as follows:

$$c_{i,t} + k_{i,t+1} = ws_i + (1+r)\, k_{i,t}$$

Let us further assume that the household faces a finite borrowing constraint such that $k_{t+1} > \underline{k}$, where $\underline{k}$ defines a borrowing constraint. What is the maximum borrowing that can be allowed in this economy so that all the agents can avoid a situation of negative consumption?

a) $\frac{w}{(1+r)}$
b) $\frac{ws_H}{(1+r)}$
c) $\frac{-ws_L}{r}$
d) None of the above

Question 7

A concave function defined $f : [0, 1] \to \mathbb{R}$

(a) always achieves a maximum but not a minimum

(b) always achieves a minimum but not a maximum

(c) always achieves a maximum and a minimum

(d) may not achieves a maximum or a minimum

Question 8

In the context of consumer choice, consider the following two statements:

I. If the binary preference relation of a consumer is not continuous, then there does not exist any utility function that represents the preference relation

II. If the binary preference relation of a consumer is rational and continuous, then all utility functions that represent the preference of the consumer are continuous functions

Choose the correct option from the four options below:

a) Only statement I is correct.
b) Only statement II is correct
c) Both statements are correct
d) None of the two statements is correct

Question 9

Let S be a set/class and R be a binary relation in S, that is, $R \subseteq S \times S$.

$$(x, y) \in R \leftrightarrow xRy$$

In other words, xRy means the element x from S has the relation R to the element y from S.

A relation R is said to satisfy property P in the class S iff for $\forall(x, y)$ such that $(x, y) \in (S \times S)$ and $x \neq y$,

$$xRy \leftrightarrow (\sim yRx)$$

In simple words, R satisfies property P iff for every pair of distinct elements x and y in S, x has the relation R to y iff y does not have the relation R to x.

Which of the following binary relations (defined on the set of all human beings ever born) satisfies property P?

(a) spouse of

(b) sister of

(c) brother-in-law of

(d) None of the above

Question 10

There is an economy composed of multiple generations of people with finite lives. Each generation lives for two periods, young and old. When a generation is old, a new generation of equal size is born young. When young, a person can work and earn wage w. They cannot work when old. Utility is of the form $U(c_y, c_o) = \ln c_y + \beta \ln c_o$, where c_y is the consumption level when young, c_o is the consumption level when old, and $\beta \in (0, 1)$. When young, a person can save a share of their wages s, to consume when they are old. What is the utility maximizing savings rate?

a. $s = w / (1 + \beta)$

b. $s = 1 - \beta$

c. $s = \beta / (1 + \beta)$

d. $s = w\beta / (1 - \beta)$

Question 11

Let X and Y be two jointly continuous random variables with joint PDF $f(x, y) = 8xy, 0 < x < y < 1$; $f(x, y) = 0$ elsewhere. Find (a) $E(Y|X = x)$, and (b) $E(XY|X = x)$

a. $\frac{2}{3}\left(\frac{1+x^2}{1+x}\right), \frac{2x}{3}\left(\frac{1+x^2}{1+x}\right)$
b. $\left(\frac{1+x+x^2}{1+x}\right), \frac{2}{3}\left(\frac{1+x+x^2}{1+x}\right)$
c. $\frac{2}{3}\left(\frac{1+2x+x^2}{1+x}\right), \frac{2x^2}{3}\left(\frac{1+x+x^2}{1+x}\right)$
d. $\frac{2}{3}\left(\frac{1+x+x^2}{1+x}\right), \frac{2x}{3}\left(\frac{1+x+x^2}{1+x}\right)$

Question 12

Consider a long run dynamic stochastic representative agent economy. The economy is closed; No capital is allowed to either flow in or flow out. N agents face a stochastic endowment each period that can take any value from the set $\{y_1 < y_2 < \cdots < y_N\}$. The agents are allowed to borrow/save using one-period discount bonds, and have linear utility. Assume that the return on bonds and the discount rate are equal. In equilibrium, what is the total amount of bonds that will trade in this economy and how much will the agent consume in period t?

a) bonds = $\frac{\sum_{i=1}^{N} y_i}{N}$, consumption= $\frac{\sum_{i=1}^{N} y_i \cdot y_t}{N}$
b) bonds = 0 , consumption = y_t
c) bonds = $\frac{y_t}{N}$, consumption = y_t
d) None of the above