選擇題：請於『答案卡』作答。每題均至少有一個正確答案。不必提供理由或過程。共 10 題，每題 10 分。

計分方式：各題所有選項均答對者，得10分。每答錯一個選項扣4分，未作答者或答錯超過二個選項者，該題以零分計算。例如某題正確答案為(A)(B)(C)，而某考生所選之答案為(A)(C)(E)，則該考生答錯兩個選項，包括(B)選項應選而未選、(E)選項不應選而選，因此該考生該題得2分。其餘情況以此類推。各題分數均獨立計算，不影響其他題分數。

1. A perfectly competitive economy consists of many consumers and firms. There are two goods, Good 1 and Good 2, with quantities q_1 and q_2, respectively. Each consumer's preferences are given by

$$u(q_1, q_2) = 100 - (q_1 - b)^2 - (q_2 - b)^2,$$

where $b > 0$ is a constant representing the consumer's bliss point for both goods. Each consumer has income $Y > 0$ that can be spent on the two goods. Let P_1 and P_2 be the market prices of Good 1 and Good 2, respectively.

Moreover, Good 1 is produced by Type-1 firms with total cost

$$TC_1(q_1) = cq_1 + (q_1)^2,$$

and Good 2 is produced by Type-2 firms with total cost

$$TC_2(q_2) = cq_2 + (q_2)^2,$$

where $c > 0$ is a constant. Firms of each type choose output to maximize profits in each market. There are 100 identical consumers and 50 identical firms of each type. The competitive equilibrium prices are (P_1^*, P_2^*) and the corresponding equilibrium aggregate quantities are (Q_1^*, Q_2^*).

Given the parameter (b, Y, c), which of the following statements regarding the equilibrium outcome is/are TRUE?

(A) If $(b, Y, c) = (5, 100, 10)$, then each consumer consumes at the bliss point, $(q_1, q_2) = (5, 5)$.
(B) If $(b, Y, c) = (10, 150, 20)$, then $P_1^* = 30$.
(C) A larger bliss point b leads to higher equilibrium prices P_1^* and P_2^*.
(D) If a consumer has a higher income Y, the equilibrium quantity Q_2^* is higher.
(E) A higher marginal cost c increases the equilibrium prices P_1^* and P_2^*.

2. Consider a continuum of competitive (price-taking) firms. Output sells at an exogenous price p, and labor and capital can be hired at exogenous prices w and v. A firm with productivity parameter θ chooses one of the following two technologies as well as inputs to maximize profit. Assume that θ is continuously distributed on $(0, \infty)$ with CDF $F(\theta)$. This parameter captures a firm's "entrepreneurship" in the sense that it shifts productivity: a higher θ raises output for any given input choice. Two technologies are available:

$$\text{Technology A: } f(L) = \theta \cdot L^{2/3},$$
$$\text{Technology B: } f(L, K) = \theta \cdot 2(LK)^{1/3}.$$

That is, Technology A uses only labor, whereas Technology B uses both labor and capital.

In the short run, capital is fixed at $K = 1$ and the firm chooses L only. In the long run, both L and K are choice variables. Let $\hat{\theta}_S$ and $\hat{\theta}_L$ denote the productivity types (if they exist) at which the firm is indifferent between the two technologies in the short run and the long run, respectively.

Given prices (p, w, v), which of the following statements is/are TRUE?

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(A) In the short run, there exists a cutoff $\hat{\theta}_S$ such that firms with low entrepreneurship ($\theta < \hat{\theta}_S$) prefer Technology A, whereas firms with high entrepreneurship ($\theta > \hat{\theta}_S$) prefer Technology B.
(B) In the short run, holding other prices fixed, an increase in w expands the set of types θ that choose Technology B.
(C) In the long run, if $w > 2v$, then firms with all possible types choose Technology B.
(D) In the long run, holding other prices fixed, a higher p causes more firms to use Technology B.
(E) Fix a firm with type θ. Given the same (p, w, v), that firm produces more in the long run than in the short run if it chooses the same technology.

3. An economy consists of a representative consumer and two oligopolistic firms. The consumer derives utility from consuming two goods, Good 1 and Good 2, in quantities q_1 and q_2, and a numeraire good in quantity q_3:

$$u(q_1, q_2, q_3) = \alpha(q_1 + q_2) - (q_1)^2 - (q_2)^2 - \beta q_1 q_2 + q_3,$$

where $\alpha > 0$ captures the market size of Good 1 and Good 2 and $\beta \in (0,1)$ measures the degree of substitutability between these two goods. A higher β implies that the goods are closer substitutes (i.e., more homogeneous). Let p_1 and p_2 be the prices of Good 1 and Good 2, respectively, and let Y be the consumer's endowment of the numeraire good. We normalize the numeraire price to $p_3 = 1$.

On the supply side, there are two firms, Firm 1 and Firm 2. Firm i produces Good i and has constant marginal cost c_i, so its total cost is

$$TC_i(q_i) = c_i q_i, \ i = 1, 2.$$

The firms compete in quantities (i.e., Cournot competition). Throughout, we assume $c_i < \alpha$.

In this question, we focus on the interior equilibrium, in which both firms produce strictly positive quantities. Given the parameters $(\alpha, \beta, c_1, c_2, Y)$, which of the following statements regarding the equilibrium outcome is/are TRUE?

(A) Holding other parameters fixed, an increase in β (i.e., the two goods become more substitutable) reduces the equilibrium aggregate output of Good 1 and Good 2.
(B) A higher β shifts each firm's reaction function inward. As a result, each firm produces less and earns lower profit.
(C) A larger market size α increases the equilibrium price gap $|p_1^* - p_2^*|$.
(D) An increase in Firm 1's marginal cost c_1 raises the equilibrium prices of both goods.
(E) The representative consumer's equilibrium utility is higher when Good 1 and Good 2 are more differentiated (i.e., when β is lower).

4. A consumer lives for three periods: youth ($t = 1$), middle age ($t = 2$), and retirement ($t = 3$). At the beginning of period 1, he chooses a consumption plan (c_1, c_2, c_3) to maximize lifetime utility

$$u(c_1, c_2, c_3) = c_1 + \beta \ln c_2 + \ln c_3,$$

where $\beta > 0$ captures the relative importance of middle-age consumption. He receives income in the first two periods, $Y_1 > 0$ and $Y_2 > 0$, and has no income in retirement, i.e., $Y_3 = 0$. He can borrow or save at the same interest rate $r > 0$. In addition, youth consumption must satisfy a subsistence minimum requirement: $c_1 \geq m$, where $m > 0$. Assume the income in his youth can cover this minimum level, i.e., $Y_1 > m$. Denote the optimal consumption plan by (c_1^*, c_2^*, c_3^*).

Please select the statement(s) that is/are TRUE.

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(A) A higher β (greater weight on middle-age consumption) implies that the consumer saves more or borrows less in youth.
(B) In period 2, he must be a saver, and the optimal choice satisfies $c_2^* < Y_2$.
(C) At the optimum, $c_2^* > c_3^*$.
(D) If $c_1^* > m$, then lowering m does not change the optimal consumption plan.
(E) Holding other things fixed, a higher interest rate r implies that the consumer saves more in youth.

5. An athlete has initial wealth $w_0 = 100$ and is risk-averse with a utility function

$$u(w) = \ln w.$$

An injury may occur and reduce his wealth. With probability $p_L = 0.3$, a low-severity injury occurs (state L) and causes a loss $d_L = 40$; with probability $p_H = 0.1$, a high-severity injury occurs (state H) and causes a loss $d_H = 70$. With the remaining probability 0.6, no injury occurs and there is no loss.

To insure against this risk, the athlete can purchase coverage from a risk-neutral insurance company. The insurance market is competitive, and contracts are actuarially fair: the premium equals the insurer's expected payout (so the insurer earns zero expected profit). The insurer offers two contracts:

Contract P (uniform payout). The athlete chooses coverage $X \geq 0$. He pays an actuarially fair premium of qX up front (before the state is realized) and receives X whenever an injury occurs, regardless of severity. Because the payout does not depend on severity, no documentation of severity is required.

Contract S (state-dependent payout). The athlete chooses (X_L, X_H), where X_L is paid only in state L and X_H is paid only in state H. The insurer charges actuarially fair unit prices q_L and q_H per dollar of coverage in states L and H, respectively, so the athlete pays a premium of $q_L X_L + q_H X_H$ up front. However, to receive the state-dependent payout, the athlete must provide documentation verifying injury severity, which imposes an additional fixed cost $0 < K < w_0$ on the athlete in both states L and H.

Please select the statement(s) that is/are TRUE. (You may use $\ln 2 \approx 0.69$, $\ln 3 \approx 1.10$ and $\ln 5 \approx 1.61$.)

(A) Under **Contract P**, the actuarially fair unit price is $q = 0.4$.
(B) Under **Contract P**, the optimal coverage is $X^* = 55$.
(C) Under **Contract S**, the athlete is fully insured and has the same wealth across all states (no injury, low-severity injury, and high-severity injury), and his utility is always decreasing in K.
(D) Under **Contract S**, the athlete pays a premium of 19.
(E) When $K = 2.5$, the athlete prefers **Contract S**.

6. Suppose there are $F \geq 2$ families ($f = 1, 2 \ldots, F$) living in a small town. One night, every family hears a same gunshot. Each family needs to decide whether to call the police without seeing other families' behavior. If any family makes the call, the police will come and catch the gunman. This gives every family a gain $u > 0$ from increased safety level. If a family make the call, it needs to pay $c > 0$ as cost. We further assume $u > c$

Please consider Nash equilibrium and select that statement(s) that is/are TRUE.

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(A) There are more than 1 pure strategy equilibria.

(B) Symmetric mixed strategy equilibrium exists and it is unique. In addition, under such equilibrium, probability of family 1 ($f = 1$) no calling is decreasing in F.

(C) Symmetric mixed strategy equilibrium exists and it is unique. In addition, under such equilibrium, probability of no family calling is decreasing in F.

(D) For some $F \geq 4$, it's possible to find equilibrium in which F_1 families don't call and F_2 families call the police with probability p^*, where $F_1 \geq 2, F_2 \geq 2, F_1 + F_2 = F, 1 > p^* > 0$.

(E) Let's consider there are N nights and there's gunshot from different gunman at each night. N is much larger than F. In addition, we further assume discount factor is 1 for all families. Then, even if there's no (monetary) transfer between families, an efficient equilibrium in which cost of making calls is shared by all families is possible.

7. Suppose there are two machines (A and B) producing food. The units of food they produce are related to the weather. If it's rainy, A produces a_1 units, and B produces 0 unit. If it's sunny, A produces a_2 units, and B produces b units. a_1, a_2, b are positive real numbers with $b > a_2$.

Without any signal, the weather is equally likely to be rainy or sunny. However, before the day starts, there's weather forecast delivered to every individual in the society. If the weather forecast gives bad signal, the weather will be rainy with $2/3$ and be sunny with $1/3$. If the weather forecast gives good signal, the weather will be rainy with $1/3$ and be sunny with $2/3$. The weather forecast gives only either bad or good signal.

There are two individuals ($i = 1, 2$) in the society. Both individuals only care about individual food consumption, and they have the same expected utility function $u(f_i) = (f_i)^\gamma$ with $1 > \gamma > 0$ and f_i is Individual i's food consumption. In the beginning (even before the weather forecast), Individual 1 owns machine A, and Individual 2 owns machine B. Individuals could trade their ownership of machines in the stock market, and any other contract is not allowed in this society. Individuals will get the food production from each machine according to individuals' shares of ownership. For example, if Individual 1 owns 70% of A and Individual 2 owns 30% of A, then 70% of food production from A will go to Individual 1 and 30% of food production from A will go to Individual 2. Please consider general equilibrium (Walrasian equilibrium) the following two cases.

Case 1: The stock market is only available before the weather forecast.

Case 2: The stock market is only available after the weather forecast and before the realization of the weather.

Please select the statement(s) that is/are TRUE.

(A) It's possible to have equilibrium outcome in which A is owned by only one individual under **Case 1 or Case 2**.

(B) It's possible to have equilibrium outcome in which B is owned by only one individual under **Case 1 or Case 2**.

(C) Under **Case 2**, if weather forecast is bad, ownership of A will be more expensive than ownership of B.

(D) Under **Case 1**, further allowing market of trading food between weathers (still before the weather forecast) will make the outcome more efficient.

(E) Under **Case 2**, further allowing market of trading food between weathers (still after the weather forecast and before the realization of the weather) will make the outcome more efficient.

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8. Consider the fruit market and the juice market in one area. Individual A is the only producer and the only seller in the fruit market, and Individual B is the only buyer in the fruit market and the only seller in the juice market. A's marginal cost of producing f units of fruits is $f^{\frac{1}{2}}$ (f can be any non-negative real number), and there's no fixed cost. In the juice market, B is facing the juice demand: $j_d = 1 - p_j$ where p_j is the price of juice, and fruit is the only input for producing juice without any other cost. B's production function is $j(f) = f^{\frac{1}{2}}$. We further assume buyers in the juice market are all price takers. Please consider the following market structures and their equilibria (let's denote p_f as the price of fruits):
Structure 1: In the fruit market and the juice market, both A and B are price takers.
Structure 2: In the fruit market, both A and B are price takers. In the juice market, B is monopoly.
Structure 3: In the fruit market, A is a price taker and B is monopsony. In the juice market, B is monopoly.
Please select the statement(s) that is/are TRUE.
(A) Under **Structure 1**, $p_j^* = \frac{1}{2}$ in the equilibrium.
(B) Under **Structure 2**, $p_f^* = \frac{-1+\sqrt{5}}{2}$
(C) Under **Structure 3**, B's profit is $\frac{7}{27}$.
(D) **Structure 1** will reach social optimal.
(E) From **Structure 3**, A and B merge, and they share the joint profit from being monopoly in the juice market. Such merger will hurt efficiency.

9. Consider a model with two generations (one parent and one child) and three periods ($t = 1, 2, 3$). The parent lives and consumes P_1 and P_2 in period 1 and period 2. The child lives and consumes C_2 and C_3 in period 2 and period 3. The parent has wealth $W > 0$ before period 1. The parent and the child have no other extra income in each period, and there's no lending or borrowing market in the economy. The parent could only decide on P_1, P_2, and W_c. $W_c \geq 0$ is the wealth given from the parent to the child. Then, the child could decide his/her consumptions without parent's intervention. The child's life time utility is $U_c(C_2, C_3) = \ln C_2 + \beta \cdot \ln C_3$ where $0 < \beta < 1$ is the child's (actual) discount factor. The parent cares about private consumption and child's consumption, and his/her lifetime utility is $U_p(P_1, P_2, C_2, C_3) = \ln P_1 + \alpha \cdot \ln P_2 + \alpha \cdot \widetilde{U_c}(C_2, C_3)$ where $\widetilde{U_c}(C_2, C_3)$ varies across parent's types, and $0 < \alpha < 1$ is the parent's discount factor and the parent's weight on child's importance. We further assume $\alpha \neq \beta$, and the price of consumption stays 1 in all periods. In addition, $\ln(\cdot)$ being individual's utility function from consumption in each period is a common knowledge. Consider the following parent's types:
Type 1: Purely altruistic and naive – the parent cares about the child's utility, but he/she thinks that the child has the same discount factor as the parent.
Type 2: Purely altruistic and all-knowing –the parent cares about the child's utility, and he/she knows well about the child's discount factor.
Type 3: Partially altruistic and naive –the parent thinks that following $\beta = \alpha$ is the best for the child, and that's how the parent cares about from child's consumption. However, the parent thinks that the child's discount factor is the same as the parent's.
Type 4: Partially altruistic and all-knowing –the parent thinks that following $\alpha = \beta$ is the best for the child, and that's how the parent cares about from child's consumption. In addition, the parent knows well about the child's discount factor.
Please select the statement(s) that is/are TRUE.

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(A) In the equilibrium, $\frac{C_2^*}{C_3^*}$ stays the same across all parent's types.

(B) Given the child knows that the parent is purely altruistic and naïve, the child should confess his time preference to the parent since the parent cares about the child's actual utility.

(C) Given the child knows that the parent is partially altruistic and naïve, the child should not confess his time preference to the parent since pretending $\beta = \alpha$ makes the parent think that the child will follow parent's preference.

(D) Given the parent is naive, the parent always has incentive to know the child's preference.

(E) If a researcher knows α and β exactly, this researcher could distinguish parent's type from observing $P_1^*, P_2^*, C_2^*, C_3^*$.

10. Consider a labor market in which workers decide to work at home or work in a company. Worker's type is $t \sim U(0,1)$ follows uniform distribution. If a worker works in a company, this worker will generate t-dollar equivalent output to the firm. If a worker works at home, this worker will earn $r(t)$ dollars. Function $r(t)$ is as follows:

$$r(t) = \begin{cases} a \cdot t, & 0 \le t \le 0.5 \\ a \cdot (1-t), & 0.5 \le t \le 1 \end{cases}, \quad a > 0.$$

Suppose each worker knows his/her own $t, r(t)$ perfectly. We further assume workers are price takers, and worker's productivity in any firm stays constant no matter how many workers are working in the firm. In addition, firms are risk-neutral, and wage is the only expenditure for the firm to operate. Please consider the following cases:

Case 1: Workers' types **can be observed** by any firm, and many firms are **competing** on hiring workers **through wage.**

Case 2: Workers' types **can't be observed** by any firm, and many firms are **competing** on hiring workers **through wage.**

Case 3: Workers' types **can be observed** by the firm, and only one firm acts as **monopsony** to hire workers.

Case 4: Workers' types **can't be observed** by the firm, and only one firm acts as **monopsony** to hire workers.

Firms under all cases know the distribution of t and function $r(t)$. Under Case 2 and Case 4, the workers are not even allowed to reveal their types to the firms.

Please select the statement(s) that is/are TRUE.

(A) The equilibrium outcome under Case 1 will be efficient, and there's always some worker(s) working in firm(s).

(B) The equilibrium outcome under Case 2 will not be efficient.

(C) The equilibrium outcome under Case 3 will not be efficient.

(D) The equilibrium outcome under Case 4 will not be efficient.

(E) Given Case 4, if there's technology to perfectly distinguish worker's type, the firm's willingness to pay for such technology is positive.