※ 注意：請於試卷內之「選擇題作答區」依序作答。

**Part 1: Multiple Choice Questions (20 points)**

Choose the most appropriate answer among the four available choices. Only one of them is correct. Each question is worth 4 points.

1. Consider a downward parallel shift to the production function. This causes the level of work effort to _____, so the MPL at the new level of work effort is _____ the MPL at the old level of work effort. In addition, the level of consumption _____.
   (a) fall; higher than; rises
   (b) rise; equal to; falls
   (c) fall; equal to; rises
   (d) rise; lower than; falls

2. An increase in the interest rate that causes a pure intertemporal substitution effect _____ an individual's current quantity of consumption demanded and _____ his current labor supply.
   (a) lowers; lowers
   (b) lowers; raises
   (c) raises; lowers
   (d) raises; raises

3. If leisure is a normal good, which of the following cause an increase in work effort?
   (a) parallel downward shift in the production function.
   (b) The substitution effect from an increase in the MPL schedule.
   (c) Both A and B.
   (d) None of the above

4. Two nations will show conditional convergence but not absolute convergence if
   (a) the initially poorer countries is farther from its own steady state then the initially richer nations.
   (b) the initially poorer countries is closer to its own steady state then the initially richer nations.
   (c) the two nations grow at the same rate but one nation is poorer than the other nation.
   (d) none of the above. It is impossible for two countries to show conditional convergence but not also show absolute convergence.

5. Which of the following statement regarding purchasing power parity (PPP) is true?
   (a) Absolute purchasing power parity states that a unit of currency will be able to buy the same amount of goods across countries, no matter how the real exchange rate changes.
   (b) Relative form of purchasing power parity state that a unit of currency will depreciate at the same rate, no matter the currency is held as domestic currency or foreign currency.
   (c) (a) and (b).
   (d) None of the above. Neither (a) or (b) is true.

見背面

※ 注意：請於試卷內之「非選擇題作答區」標明題號依序作答。

**Part 2: Two periods general equilibrium model (30 points)**

Consider the following two period general equilibrium model with a representative household and a representative firm.

1. The firm's problem.

The firm uses $K_t$ units of capital to produce $Y_t = 4K_t^{1/3}$ goods as output. Goods and capital can be sold at prices $p_t$ and $p_{t+1}$ in period $t$ and $t+1$, respectively. $Y_t$ can be sold as consumption goods or used as investment $I_t$. In period $t+1$, the firm starts with $K_{t+1} = (1-d)K_t + I_t$ and produces $Y_{t+1} = 4K_{t+1}^{1/3}$. After production in $t+1$, the firm is left with $(1-d)K_{t+1}$ units of capital. The nominal interest rate between period $t$ and $t+1$ is $i_t$. Note that the real interest follows $(1+r_t) = \frac{p_t}{p_{t+1}}(1+i_t)$.

(a) The profit at period $t$ is $\pi_t = p_t Y_t - p_t I_t$. What is the firm's profit at $t+1$, $\pi_{t+1}$, in terms of $p_{t+1}$, $Y_{t+1}$, and $K_{t+1}$? (2 points)

(b) The firm choses $I_t$ to maximize its total discounted profits as the following:

$$\max_{I_t} \ \pi_t + \frac{\pi_{t+1}}{1+i_t} .$$

Formulate firm's optimization problem with its constraints (2 points), and derive the formula for the firm's optimal investment $I_t$ (4 points).

2. Household's problem.

The representative firm is owned by the representative household, and the profit is the household's only resource of income in each period. The household maximizes his lifetime utility as:

$$\max_{c_t,\, c_{t+1}} \ \log(c_t) + \beta \log(c_{t+1}),$$

subject to his lifetime budget constraint,

$$p_t c_t + \frac{p_{t+1} c_{t+1}}{1+i_t} = \pi_t + \frac{\pi_{t+1}}{1+i_t}.$$

(a) Derive the household's Euler equation.(4 points)

(b) What is the household's marginal propensity to consume of current spending $p_t c_t$ ? (2 points)

3. General Equilibrium:

State the definition of the competitive equilibrium (general equilibrium) of this two period economy. You need to specify the market clearing conditions. (6 points)

4. Assume $d = 1$, $\beta = 1, K_t = 1$. Calculate the general equilibrium value of $c_t, c_{t+1}, I_t, K_{t+1}$, and the real interest rate $r_t$ (note that the prices and nominal interest rate cannot be determined here). (10 points)

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**Part 3: 全面均衡分析 (計 50 分)**

考慮 Part 2 的延伸模型。想像經濟社會由政府及眾多同質的家計單位所組成。政府在商品市場中購買財貨 $G_t$，財源來自家計單位的定額稅 $T_t$ 或發行一期到期的短期實質公債。令 $b_t$ 表示 $t$ 期的起始公債餘額，$r_t$ 為對應的實質利率，則各期政府預算滿足：

$$G_t = T_t + b_{t+1} - (1+r_t)b_t \text{ 。}$$

家計單位既是生產者也是消費者。若 $k_t$ 是 $t$ 期的起始資本存量，$n_t$ 是 $t$ 期的勞動小時，則 $t$ 期的產出或所得是 $y_t = A_t F(k_t, n_t)$，生產函數滿足固定規模報酬及其他古典性質，$A_t$ 是外生給定的生產衝擊。家計單位的各期效用 $u(c_t, l_t)$ 取決於消費 $c_t$ 及休閒 $l_t = 1 - n_t$（時間稟賦等於一），效用函數滿足所有古典性質。家計單位可以累積資本 $k_t$ 或向政府購買公債 $b_t$，其跨期選擇問題是

$$\begin{aligned} \max_{\{c_t, n_t, k_{t+1}, b_{t+1}\}} \quad & \sum_{t=0}^{\infty} \beta^t u(c_t, l_t), \quad \beta \in (0,1) \\ \text{subject to} \quad & l_t + n_t = 1, \forall t, \\ & c_t + i_t + b_{t+1} = A_t F(k_t, n_t) + (1+r_t)b_t - T_t, \forall t, \\ & i_t = k_{t+1} - (1-\delta)k_t, \forall t. \end{aligned}$$

上述問題中，$\delta \in [0,1]$ 是資本折舊率，$i_t$ 是 $t$ 期投資，$b_t$ 是起始公債持有量。此一經濟社會的全面均衡要求 $c_t + i_t + G_t = y_t = A_t F(k_{t-1}, n_t)$。請根據以上模型回答以下各題。[提示：除最後一小題外，本題不需求解一階條件]

1. [10 分] 假設政府於 $t$ 期增加商品購買量 $G_t$，以後各期維持不變，全部由定額稅 $T_t$ 融通。請根據直觀或商品市場供需模型分析此一政策對 $t$ 期均衡的影響，包括消費，勞動，投資，產出及實質利率的變動。僅列示結果而未說明者，不計分。
2. [10 分] 以上的政府支出若全部由發行公債支應，請問結果有何異同？若政府的稅收來自所得稅 $T_t = \tau_t y_t$，$\tau_t \in (0,1)$ 代表稅率。請問結果有何異同？請敘明理由，未說明者不計分。
3. [10 分] 假設 $t$ 期的 $A_t$ 暫時性下降一期，請根據直觀或商品市場供需模型分析此一外生衝擊對 $t$ 期均衡的影響，包括消費，勞動，投資，產出及實質利率的變動。僅列示結果而未說明者，不計分。
4. [10 分] 「氣象達人」預測 5 期之後將發生地震，造成資本存量 $k_{t+5}$ 下降。假設各期生產衝擊 $A_t$ 不變，請根據直觀或商品市場供需模型分析此一預期衝擊對 $t$ 期均衡的影響，包括消費，勞動，投資，產出及實質利率的變動。
5. [10 分] 考慮本大題的原始模型。令 $u(c_t, l_t) = \theta \ln c_t + (1-\theta)\ln l_t$，$y_t = A_t k_t^{\alpha} n_t^{1-\alpha}$，$G_t = g y_t, \theta, \alpha, g \in (0,1)$。假設各期 $A_t = A$。請求算資本，勞動，消費及產出的恆定狀態(steady state)，並分別說明 $A$ 及 $g$ 上升對恆定狀態的影響。

試題隨卷繳回