國立雲林科技大學
101學年度博士班招生考試試題

系所別：財務金融系
科　目：微積分

每題 10 分

1. For what values of x is $x+3(2-x)\geq 4-x$?

2. For what value x in the domain of definition of the following function is continuous. $f(x)=\dfrac{x}{x^2-1}$

3. Let $f(x)=\dfrac{3+x}{3-x}$, $x\neq 3$. Evaluate $f'(2)$ from the definition.

4. Calculate dy/dx if $e^{xy}+y\ln x=\cos 2x$.

5. For what values of x do the following series converge? $\sum_{n=1}^{\infty}\dfrac{n(x-1)^n}{2^n(3n-1)}$.

6. Evaluate the integral $\int_0^1 x^3e^x\,dx$.

7. $\lim_{x\to 0}\dfrac{\exp(x^2)-1}{x^2}=?$

8. Let $x^4+x^3y-2x^2y^2+6xy-5y^2-2y+1=0$. Find the derivative of $\dfrac{dy}{dx}$ at the point (1, 1).

9. Determine the convergence or divergence of the series $\sum_{n=1}^{\infty}\dfrac{1}{n!}$.

10. Find the first-degree Taylor polynomial for $f(x)=\dfrac{1+e^{-x}}{e^x+e^{-x}}$ at $x=0$.

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本份試卷共 6 大題計算問答題，未提供計算過程或說明者不計分。

1. (15 points) Please briefly explain the following terms:
   (a) Constant returns to scale
   (b) Wage discrimination
   (c) Coase theorem
   (d) Expected utility theory
   (e) Inferior good
2. (10 points) Please make an example to illustrate the "Prisoner's Dilemma (囚犯的困境)" in the game theory. (You need to specify the players, the strategies and the corresponding payoffs in a normal form matrix)
3. (9 points) Please draw a graph to illustrate the "deadweight loss" in the following case.
   (a) Monopoly
   (b) Lump-sum tax on the seller of goods
   (c) Price ceiling
4. (16 points) 近來台灣對於電價是否應該調漲有相當熱烈的討論。贊成者認爲台灣電價與外國相較之下偏低，調漲可反應成本，避免台電的虧損繼續擴大。反對者認爲台電虧損乃經營不善所致，應積極整頓經營管理，而不宜將過高的經營成本轉嫁到消費者身上。
   (a) 請說明爲何政府要管制台電的電價?
   (b) 請說明爲什麼台電的經營管理不如民間企業來的有效率?
   (c) 有人認爲將台電民營化就可以解決經營管裡沒有效率的問題，請問導致台電遲遲無法民營化的原因可能爲何?
   (d) 若台灣電價確實因政府管制的因素偏低，長期來看會有何不良的影響?

5. (25 points) Consider a standard Solow model described by the following equations:

$$Y = (1-\tau)K^{\alpha}(AL)^{1-\alpha}, \quad 0 < \alpha < 1$$

$$\dot{K} = sY, \ \frac{\dot{L}}{L} = 0, \ \frac{\dot{A}}{A} = g$$

where Y is output, K is capital stock, A is the effectiveness of labor, L is labor.
Note: τ is a government tax on output, and all tax revenue collected by the government is spent on an ongoing war that does not contribute to either output or capital stock of the economy.

   (a) Define capital per effective worker as $k = K/AL$, and derive an expression for its evolution over time: dk/dt.

(b) Derive the long run equilibrium level of capital per effective worker, k^*, and the steady state output per effective worker, y^*, where $y = Y/AL$. Suppose the war takes an unfortunate turn for worse, and the government must increase the tax rate in order to buy more tanks. What will be the effect of increasing the tax on y^*?

(c) Now suppose that the tax on output also hurts individual's incentives to invent new technologies. Specifically, assume that the growth rate of technology, g, is given by $g = b(1-\tau)^{1/\alpha}$ where $b > 0$. What is the new steady state level of output per effective worker, y^*? What is the effect of an increase in the tax on y^* now? Describe in words the two opposing effects of the tax on y^*.

(d) Continue to assume $g = b(1-\tau)^{1/\alpha}$, and recall that consumption is given by $C = (1-s)Y$. What is the growth rate of consumption in the steady state? How will the increase in the tax rate affect the growth rate of consumption?

6. (25 points) Consider an open economy in which the real exchange rate is fixed and equal to one. Consumption, investment, government spending, and taxes are given by

$$C = 10 + 0.8 \times (Y - T),\ I = 10,\ G = 10, \text{ and } T = 10,$$

Imports and exports are given by

$$IM = 0.3 \times Y \text{ and } X = 0.3 \times Y^*$$

Where Y^* denotes foreign output.

(a) Solve for equilibrium output in the domestic economy, given Y^*. What is the multiplier in this economy? If we were to close the economy – so exports and imports were identically equal to zero – what would the multiplier be? Why would the multiplier be different in a closed economy?

(b) Assume that the foreign economy is characterized by the same equations as the domestic economy (with asterisks reversed). Use the two sets of equations to solve for the equilibrium output of each country. What is the multiplier for each country now? Why is it different from the open economy multiplier in part (a)?

(c) Assume that domestic government has a target level of output of 125. Assuming that the foreign government does not change G^*, what is the increase in G necessary to achieve the target output in the domestic economy? Solve for net exports and the budget deficit in each country.

(d) Suppose each government has a target level of output of 125 and that each government increases government spending by the same amount. What is the common increase in G and G^* necessary to achieve the target output in both countries? Solve for net exports and the budget deficit in each country.

(e) Why is fiscal coordination, such as the common increase in G and G^* in part (d), difficult to achieve in practice?