EXAM

Answer **four** questions. Question one is compulsory. Each individual question carries equal marks, though students should allot their time within questions according to the marks given per sub-question.

Name: _____

Please use the following notation in your answers.

Symbol	Meaning
G	Pure government expenditures in nominal terms
Y	National Income in Nominal Terms
C	Consumption of goods supply by households, in nominal terms
T	Taxes
θ	Personal Income Tax Rate
YD	Disposable Income of Households
α_1	Propensity to consume out of regular (present) income
α_2	Propensity to consume out of past wealth
ΔH_s	Change in cash money supplied by the central bank
ΔH_h	Cash money held by households
H, H_{-1}	High Powered cash money today, and yesterday ($_{-1}$)
V	Wealth of Households, in nominal terms
$B_{h,cb}$	Bills held by households, central banks.
r	Interest Rate on bills.
W	Nominal Wage Rate.
N	Labour demanded/supplied
X	Exports.
μ	Import Propensity.

1. (50 points) Use the behavioural transactions matrix given in table 1 to answer the following question.

	1. Households	2. Production	3. Government	$\sum$
1. Consumption	-C_d	+C_s		0
2. Government Expenditure		+G_s	$-G_d$	0
3. [Output]		[Y]		0
4. Factor Income	$+W \cdot N_s$	$-W \cdot N_d$		0
5. Taxes	$-T_s$		$+T_d$	0
6. Change in Money Stock	$-\Delta H_h$		$+\Delta H_s$	0
$\sum$	0	0	0	0

Table 1:

(a) (5 points) Why should the rows and columns sum to zero? Give an economic interpretation, and contrast this type of modeling in mainstream macroeconomics.

Answer. Rows and Columns sum to zero because stocks must equal flows. An economic interpretation is that the money-denominated flows must go somewhere in the system, and be tracked. The mainstream can't account for this because they don't use accounting identities as basic postulates of their model. Columns represent net wealth while rows represent transactions between the sectors. Horizontal lines give the circular flow model in this case, while vertical columns simply record transactions and are instantiations of simple accounting identities.

(b) (5 points) Is this economy open or closed? Why?

Answer. Closed. There is no import/export sector, and only 1 economy is modeled.

(c) (5 points) Why does [output] appear only once in the matrix?

Answer. Output is a residual of economic activity, a summary column. It is not a transaction but rather it is the *tota* of the system. (3)

(d) (10 points) Give an economic explanation for each row, 1–6, as if you were writing a textbook entry on this model.

Answer. See godley pg. 60. (1.5 each, 1 for an attempt)

(e) (10 points) Give an expression for the Gross Domestic Product of this economy. Justify your answer with reference to your definitions in parts 1 and 2 of this question.

Answer. $Y = G + C$. Students should show where they get this from. Slapping down the def. gets them 2. Extra marks for mentioning the AD model.

(f) (10 points) Give an expression for Total Production in this economy.

Answer. . $Y = G + C = WB$. Any explanation of this is good. If they slap down the formula give 2.

(g) (5 points) What further behavioural assumptions are required to 'close' this model?

Answer. Any of the supply constraints ($G_S = G_D$, etc) plus the consumption function mentioned in some way plus the assumption of a service economy, no saving/investment, etc. Govt. Money is the only asset, the economy is demand-led, the price of labour is fixed at w and labour is totally elastic in supply. There is perfect foresight, there is no growth, and so on.

G
$Y = G + C$
$T = \theta \times Y$
$YD = Y - T$
$C = \alpha_1 \times YD + \alpha_2 \times H_{-1}$
$\Delta H_s = G - T$
$\Delta H_h = YD - C$
$H = \Delta H + H_{-1}$

Table 2:

2. (50 points) Use the equations given in table 2 to analytically derive important properties of the SIM model.

   (a) (5 points) Define what you understand by the term 'Keynesian Multiplier'.

Answer. The Keynesian Multiplier is defined as "the effect on demand of any exogenous increase in spending, such as an increase in government outlays is a multiple of that increaseuntil potential is reached. Thus, a government could stimulate a great deal of new production with a modest outlay: if the government spends, the people who receive this money then spend most on consumption goods and save the rest. This extra spending allows businesses to hire more people and pay them, which in turn allows a further increase consumer spending. This process continues. At each step, the increase in spending is smaller than in the previous step, so that the multiplier process tapers off and allows the attainment of an equilibrium. This story is modified and moderated if we move beyond a 'closed economy' and bring in the role of taxation: the rise in imports and tax payments at each step reduces the amount of induced consumer spending and the size of the multiplier effect."

   (b) (5 points) Define what you understand by the term 'Steady State'.

Answer. A steady state is defined as a stable condition that does not change over time or in which change in one direction is continually balanced by change in another. In terms of our transactions matrix approach, the steady state is reached when short term changes in flows do no change stocks long term, i.e. the ratio of the variables to one another remains constant.

   (c) (15 points) Solve the system of equations for Y and a formulation for the multiplier in this model, in terms of Y, G, θ and α_1 and α_2.

Answer.

$$
\begin{aligned}
YD &= Y - T && (1)\\
T &= \theta \cdot Y && (2)\\
YD &= Y(1-\theta) && (3)\\
C &= \alpha_1 \cdot YD + \alpha_2 \cdot H_{-1} && (4)\\
C &= \alpha_1 \cdot Y(1-\theta) + \alpha_2 \cdot H_{-1} && (5)\\
Y &= C + G && (6)\\
Y &= G + \alpha_1 \cdot Y(1-\theta) + \alpha_2 \cdot H_{-1} && (7)\\
Y &= \frac{G + \alpha_2 \cdot H_{-1}}{1 - \alpha_1(1-\theta)} && (8)
\end{aligned}
$$

   (d) (15 points) Derive an expression for the steady state solution of this model in terms of Y, G, T, and θ.

Answer. $G = T^* = \theta \cdot W \cdot N^* = \theta Y^*$, so we must have $Y^* = \frac{G}{\theta}$, and $YD^* = C^* = \frac{G \cdot (1-\theta)}{\theta}$. An alternative derivation will do as well:

$$
\begin{aligned}
\Delta H_h &= 0 && (9)\\
\Delta H_h &= YD - C = 0 && (10)
\end{aligned}
$$

$$YF = Y - G \quad (13)$$
$$YD = Y - T \quad (14)$$
$$G^* = T^* \quad (15)$$
$$T = \theta Y \quad (16)$$
$$G = \theta Y \quad (17)$$
$$Y^* = \frac{G^*}{\theta} \quad (18)$$

(e) (10 points) What would the steady state solution of this model look like? Sketch a graph of the steady state solution over 50 periods from an initial starting point of 20. Interpret graphically the effect on national income of a permanent increase in government expenditure from \$20 to \$40 per period.

Answer. Curve straight from from pg. 72 of Godley.

3. Use the equation system for model SIM and the period vales given in table 3 to answer this question. Assume a service economy with a tax rate of 18%, while the parameters of the consumption function are $\alpha_1 = 0.6$ and $\alpha_2 = 0.4$. Assume the causal chain is set off from a stream of payments of \$20 from the government. These expenditures generate income, a tax yield, a money supply, and a consumption stream. The initial government injection will have ripple effects throughout the economy.

Equation/Period	1	2	3
G	0	20	20
$Y = G + C$	0	39	
$T = \theta \times Y$	0	7	
$YD = Y - T$	0	32	
$C = \alpha_1 \times YD + \alpha_2 \times H_{-1}$	0	19	
$\Delta H_s = G - T$	0	13	
$\Delta H_h = YD - C$	0	13	
$H = \Delta H + H_{-1}$	0	13	

(a) (20 points) Calculate the values of each equation for period 3, assuming a tax rate of 20%. Make sure to show your workings clearly.

Answer. Here are a few ways to answer this question, assuming some students go with a theta of 0.18 and some with a theta of 0.20.

The impact of \$20 of government expenditure

$\theta = .20$

Period	1	2	3	n
G	0	20	20	20
$Y = G + C$	0	38	48	100
$T = \theta.Y$	0	8	10	20
$YD = Y - T$	0	31	38	80
$C = \alpha_1.YD + \alpha_2.H(-1)$	0	18	28	80
$\Delta H_s = G - T$	0	12	10	0
$\Delta H_h = YD - C$	0	12	10	0
$H = \Delta H + H(-1)$	0	12	23	80

Table 3: Students *must* show workings clearly.

(b) (10 points) Repeat the calculation for a tax rate of 10%. What is the economic intuition behind your new result?

Answer. Here values close to the ones generated by Eviews will be fine, but more marks are going for the interpretation.

(c) (10 points) What values of G, T and YD to be in the steady state? Why would you expect these values?

Answer. I would expect the value of G to remain at 20. I would expect the value of T to

The impact of \$20 of government expenditure

$\theta = 0.18$

Period	1	2	3	n
G	0	20	20	20
$Y = G + C$	0	39	50	111
$T = \theta.Y$	0	7	9	20
$YD = Y - T$	0	32	41	91
$C = \alpha_1.YD + \alpha_2.H(-1)$	0	19	30	91
$\Delta H_s = G - T$	0	13	11	0
$\Delta H_h = YD - C$	0	13	11	0
$H = \Delta H + H(-1)$	0	13	24	91

The impact of \$20 of government expenditure

$\theta = 0.1$

Period	1	2	3	n
G	0	20	20	20
$Y = G + C$	0	43	57	198
$T = \theta.Y$	0	4	6	20
$YD = Y - T$	0	39	51	179
$C = \alpha_1.YD + \alpha_2.H(-1)$	0	23	37	178
$\Delta H_s = G - T$	0	16	14	0
$\Delta H_h = YD - C$	0	16	14	0
$H = \Delta H + H(-1)$	0	16	30	178

remain at 0.18/0.20 and I would expect the value of YD to get very large relative to the initial level of 0. Extra marks for actually working out the steady state value for YD.

(d) (10 points) If you included imperfect foresight (i.e. expectations on YD, disposable income) into this model, how do you expect your results to change?

Answer. The model changes by including expectations in the consumption function, so we get $C_D = \alpha_1 YD^e + \alpha_2 H_{h-1}$. Uncertainty forces the households to hold more cash, basically. Then expectations change household wealth by this amount: $H_h - H_d = YD - YD^e$. Any relevant indication that they student has read Godley pgs. 78–81 gets good marks.

4. Use the model of single government with household Portfolio choice PC to answer this question.

				Central Bank		
	Households	Production	Government	Current	Capital	$\sum$
Consumption	- C	+ C				0
Govt. Expenditures		+ G	-G			0
Income = GDP	+Y	-Y				0
Interest Payments	$+r_{-1} \cdot B_{h-1}$		$-r_{-1} \cdot B_{-1}$	$+r_{-1} \cdot B_{cb-1}$		0
Central Bank Profits			$+r_{-1} \cdot B_{cb-1}$	$-r_{-1} \cdot B_{cb-1}$		0
Taxes	-T		+T			0
Change in Money	$-\Delta H$				$+\Delta H$	0
Change in Bills	$-\Delta B_h$		$+\Delta B$		$-\Delta B_{cb}$	0
$\sum$	0	0	0	0	0	0

Table 4:

(a) (5 points) Define what you understand by a 'bond'.

Answer. A bond is a risk-less, interest-bearing financial instrument issued by a body such as a government to raise cash for the government and restrict circulation. The person buying the bond gets the principal plus the coupon back at the end of the bond's term.

(b) (5 points) Briefly describe how the inclusion of a central bank might affect the behaviour of the SIM equation system given in table 3.

Answer. A central bank makes this model like PC. The CB can make a profit, and the CB affects the money stock in various ways. Any discussion here is good. The existence of a CB forces the household's decision-making system to be partitioned into allocation and consumption phases, because disposable income can be allocated to either holding cash balances or bills—this introduces the idea of Liquidity preference. Extra marks if they discuss this.

(c) (20 points) Derive an expression for household wealth using the transactions matrix given in table 4. How does this affect the consumption function given in model SIM? Sketch a graph of disposable income and consumption over 50 periods to the steady state.

Answer. $Y^* = \frac{G+r \cdot B_h^* \cdot (1-\theta)}{\theta} = \frac{G_{NT}}{\theta}$, because in Steady state $C^* = YD^* = Y^* + r \cdot B_h^* - T^* = Y^* + r \cdot B_h^* - \theta \cdot (Y^* + r \cdot B_h^*)$. Any manipulation is extra. This is just reading off the model. Interpretation carries the main marks.

(d) (10 points) Can the central bank make a profit in this economy? If so, how much, and where does this profit go?

Answer. Yes, the CB can make a profit on bills it issues, by ΔH. The student should discuss this result and show me they understand the point.

(e) (10 points) Does the public sector pay interest on its own debt? What does this imply for real world monetary policy? Give an application of this property from your own reading or experience.

Answer. Yes, in the form of interest on it's own debt. A real world implication of this might be something like the 1998 East Asian Crisis, etc.

5. Use the open-economy model REG to answer the following questions:
   (a) (25 points) In the REG model, the foreign trade multiplier for the Northern economy is given by
   $$Y^{N*} = \frac{(G^N_{NT} + X^N)}{\theta + \mu^N}. \tag{19}$$
   Describe the components of this equation, and discuss how it might affect the evolution of regional income for the North. What is the optimal policy for the government if it wants to maximise the trade income of the north?

Answer. First the components. Students must show they understand what each component is, and how they relate to one another. How will the Harrod relationship affect the north's income? By changing the ability of the North to reach the steady state. The government must open up to trade and buy more imports, which will stimulate economic activity in the south.
The government needs to exercise its control over θ and G^N_{NT} to ensure it hits the SS.

   (b) (25 points) The figure below shows the evolution of the balances of the South region following an increase of propensity to import μ in the South region. Describe the evolution of these balances and give **three** reasons why the effects of the change in import propensity taper off.

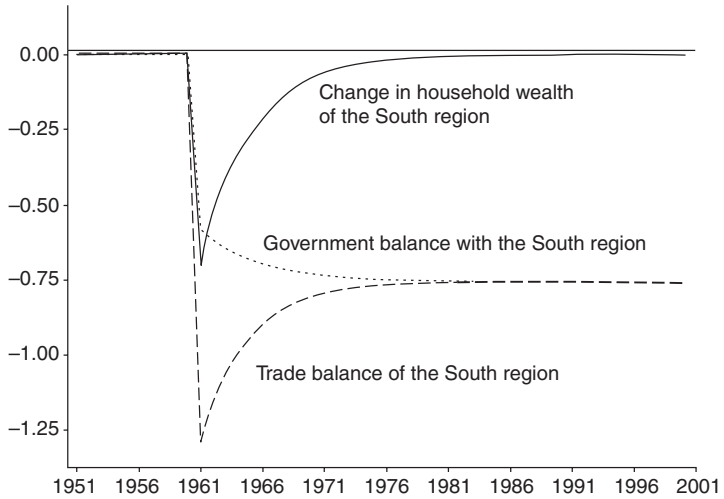

Figure 1: Evolution of balances of the South Region, following an increase in the propensity to import.

Answer. Looking for a causal story here, something along the lines of: We end up with a twin deficit situation where $G^N_{NT} - T^N = X^N - IM^N$, and the balance of payments recovers after its initial shock. Then decreases in exports in the north which evens out the deficit somewhat, but overall there is an increase in disposable income in the south which allows the North/South gap to close. Why does μ's effect taper off? Because it's less than 1, because the south's imports have dropped, overall consumption in the south will drop while disposable income in the north rises.