NAME **SOLUTIONS**

STUDENT NUMBER **VERSION #1**

UNIVERSITY OF TORONTO AT SCARBOROUGH

ECM B06F

MACROECONOMICS

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SAMPLE MIDTERM #1

MID-TERM EXAM

INSTRUCTIONS:
1. Total time for this examination is 90 minutes.
2. Total marks = 90
3. This test has nine (9) pages !
4. Aids allowed: Calculator
5. Do not use pencil. **If pencil is used then that portion of (question on) your exam cannot be considered for regrading.**

MARKS	
Multiple Choice	30 /30
SHORT ANSWER PROBLEMS	
QUESTION 1	20 /20
QUESTION 2	10 /10
QUESTION 3	10 /10
QUESTION 4	20 /20
TOTAL	90 /90

MULTIPLE CHOICE **(30 marks - Equally weighted, 3 marks each)**

Do ALL of the following ten multiple choice questions.

#1 In the classical model of chapter 3 with fixed income, if the interest rate is too low, then investment is too _____ and the demand for output _____ the supply.

A) high; exceeds
B) high; falls short of
C) high; equals
D) low; exceeds
E) low; falls short of
F) low; equals

Choice: A

#2 According to the definition used by Statistics Canada, people are considered to be unemployed if they:

A) are out of a job but not looking for work.
B) retired from the labour force.
C) have found a job but are waiting for it to start.
D) are in the military service.

Choice: C

#3 In the Solow model with technological change, if population grows at a 2 percent rate, the efficiency of labour grows at a 2 percent rate, and capital depreciates at a rate of 3 percent, then in the steady state total output grows at a _____ percent rate.

A) 0
B) 2
C) 3
D) 4
E) 5
F) 7

Choice: D

#4 An increase in the saving rate starting from a steady state with more capital than in the Golden Rule causes output to _____ in the transition to the new steady state.

A) increase
B) decrease
C) first increase, then decrease
D) first decrease, then increase

Choice: A

#5 If the unemployment rate is 6 percent and the number of employed is 188 million, then the labour force equals _____ million.

A) 11.28
B) 176.72
C) 188
D) 200
E) 212

Choice: D

#6 Which of the following is an example of frictional unemployment?

A) Dave searches for a new job after voluntarily moving to Vancouver.
B) Elaine is willing to work for less than minimum wage, but employers cannot hire her.
C) Bill is qualified and would like to be an airline pilot, but airlines do not find it profitable to hire him at the wage established by the airline pilot's union.
D) Joan is willing to work at the going wage, but there are no jobs available.
E) All of the above.
F) A, B and C above.

Choice: A

#7 Assume that the consumption function is given by $C = 150 + 0.85(Y - T)$, the tax function is given by $T = t_0 + t_1Y$, and Y is 5,000. If t_1 decreases from 0.3 to 0.2, then consumption increases by:

A) 525
B) 500
C) 425
D) 85
E) none of the above

Choice: C

#8 Workers unemployed as a result of wage rigidity are:

A) actively searching for a job to match their skills.
B) not eligible to receive unemployment insurance benefits.
C) waiting for a job to become available.
D) relocating to another part of the country as a result of sectoral shifts.
E) all of the above.

Choice: C

#9 Assume that the adult population of the United States is 191.6 million, total employment is 117.6 million, and 9.4 million are unemployed. Then the unemployment rate, as normally computed, is approximately _____ percent.

A) 4.9
B) 7.4
C) 7.9
D) 9.4

Choice: B

#10 In the Solow model with technology change, by increasing the efficiency of labour at rate *g*:

A) the real wage and the real rental price of capital both grow at rate *g*.
B) the real wage grows at rate *g* but the real rental price of capital is constant.
C) the real wage is constant but the real rental price of capital grows at rate *g*.
D) both the real wage and the real rental price of capital are constant.
E) both the real wage and the real rental rate of capital grow at rate (n+g).

Choice: B

SHORT ANSWER PROBLEMS **(60 MARKS - Various weights)**

#1 **(20 marks)** Assume that given the available inputs and technology 7,000 units of real output can be made. Consumption is given by the equation **$C = 1{,}200 + (0.30)\bullet(Y - T)$**. Investment is given by the equation **$I = 3{,}000 - 50r$**, where r is the real interest rate in percent (i.e. if r = 3 then this means the interest rate is 3%). Taxes are 1,500 and government spending is 1,700.

A) In long-run equilibrium what are the values of Y, C, I, r and the (three) different types of savings? Sketch a rough diagram of this long-run equilibrium.

$Y = 7{,}000$

$C = 1{,}200 + 0.3(Y - T)$
$= 1{,}200 + 0.3(7{,}000 - 1{,}500)$
$= 1{,}200 + 0.3(5{,}500)$
$= 1{,}200 + 1{,}650 \quad$ **$= 2{,}850$**

$S_{NAT} = Y - C - G$
$= 7{,}000 - 2{,}850 - 1{,}700$
$= 2{,}450$

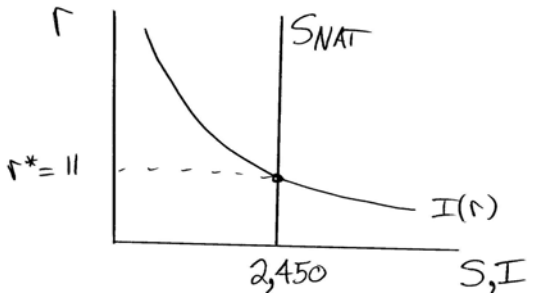
Long Run Equilibrium (S = I): $S_{NAT} = I$
$2{,}450 = 3{,}000 - 50r$
$50r = 550$
$r^* = 550/50 = 11$ percent

Check: $I(r^*) = 3{,}000 - 50(r^*) = 3{,}000 - 50(11)$
$= 3{,}000 - 550 = 2{,}450 = S_{NAT}$

$S_{PVT} = Y - C - T$ $= 7{,}000 - 2{,}850 - 1{,}500 =$ **$2{,}650$**

$S_{GOVT} = T - G$ $= 1{,}500 - 1{,}700 =$ **-200**

Check: $S_{NAT} = 2{,}450 = I(r^*)$
$= S_{PVT} + S_{GOVT}$
$= Y - C - G$



B) Now assume there is a technological innovation that makes business want to invest more. It raises the investment equation to **I= 3,500 - 50r**. What are the new long-run equilibrium values of Y, C, I, r and the (three) different types of saving? Sketch a rough diagram of both long-run equilibriums (Hint: Remember to label the axis and shift quantities).

This is a "trick" question. The answer is quite simple.

Since in the long run output is determined by the levels of inputs and technology (neither of which has changed) then output (Y) does not change.
Y = 7,000

Since Y and taxes have not changed then consumption (C) also does not change.
C = 2,850

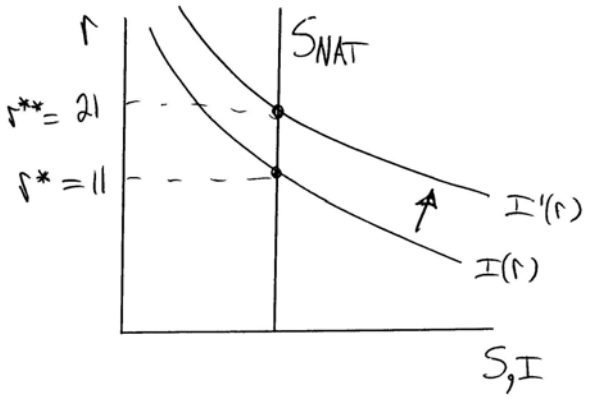
Saving of all (three) types also does not change (as Y, C, T & G have not changed). For example, this means that the location of S_{NAT} has not changed/shifted .

Further, since national saving is a vertical spike (not a function of r) then a shift of the investment function only raises the real rate of interest. As a consequence investment does not change either (since it is constrained by saving, S_{NAT} = I').
S_{PVT} = Y - C - T = 2,650

S_{GOVT} = T - G = - 200

S_{NAT} = 2,450 = I'(r)**

2,450 = 3,500 - 50r**
50r** = 1,050
r = 1050/50 = 21 percent**



#2 **(10 marks)** Suppose the size of the labour force is constant and the rate of job separation is 5 percent per month and the rate of job finding is 35 percent per month.

A) Write down the expression for the natural rate of unemployment (long run unemployment rate). What is the long run unemployment rate equal to in this environment?

When the labour force is constant (with no entry or exit):

Long Run Unemployment Rate = s/(s + f)

Where: s = the rate of job separation (rate of job loss)
f = the rate of job finding (new job creation)

Here s = 5 % and f = 35% respectively so:

Long Run Unemployment Rate = 0.05/(0.05 + 0.35) = 5/40 **= 12.5 %**

B) In words explain three ways that employment insurance (EI), sometimes called unemployment insurance, effects the long run rate of unemployment in Canada.

In Canada, Employment Insurance (EI) tends to *raise* the level of frictional unemployment (which in turn raises the long run unemployment rate). This occurs for the following reasons:

- EI tends to *increase* the rate of job separation (s).
  - Because workers know that their incomes are partially protected by EI, they are less likely to seek jobs with stable employment prospects and less likely to bargain for guarantees of job security.
  - When firms face a temporary sectoral reduction in demand they are more likely to temporarily lay off employees as they will receive EI benefits and the firm bear no cost of the worker's EI benefits (no experience rating).
- EI tends to *reduce* the rate of job finding (f).
  - The unemployed who receive EI benefits are (all else the same) less likely to search for new employment and are more likely to turn down unattractive job offers.

#3 **(10 marks)** Consider an economy whose GDP consists entirely of the production of audio CDs and cassette tapes. We want to compare this production in two different years 1992 (the base year) and 2001 (the later year).

	1992		**2001**	
	Quantity	**Price**	**Quantity**	**Price**
CDs	1000	\$ 15	1700	\$ 20
Tapes	2000	\$ 5	2200	\$ 10

A) Find nominal GDP in 1992 and 2001.

Nominal GDP in 1992 = 15(1,000) + 5(2,000) = 15,000 + 10,000 = **\$ 25,000**

Nominal GDP in 2001 = 20(1,700) + 10(2,200) = 34,000 + 22,000 = **\$ 56,000**

B) Find real GDP in 1992 and 2001.

Real GDP in 1992 = Nominal GDP in 1992 = \$ 25,000 **(As 1992 is the base year)**

Real GDP in 2001 = 15(1,700) + 5(2,200) = 25,500 + 11,000 = **\$ 36,500**

C) Find the GDP deflator for 2001. Use the GDP deflator to estimate the inflation rate between 1992 and 2001. Is this estimate expected to be correct on average? Explain.

GDP deflator = Nominal GDP/(Real GDP)

GDP deflator in 2001 = 56,000/36,500 = **1.534**

Since in the base year the GDP deflator is 1.00 by definition then this approach estimates that there has been **53.4 percent inflation** between 1992 and 2001.

No. The GDP deflator tends to ***under estimate*** the level of inflation.

This occurs as the GDP deflator uses current (output) weights which tends to over-emphasize the effect of substitution due to relative price changes. This means that goods (or services) whose prices rise the most receive a smaller weighting (due to substitution to alternatives) thereby lowering the estimate of inflation present.

#4 **(20 marks)** Assume that a country's production function is $Y = AK^{.4}L^{.6}$. The ratio of capital to output is 5, the growth rate of output is 5 percent, the depreciation rate is 2 percent, and the population is growing at 1 percent annually. Capital is paid its marginal product.

A) What is the marginal product of capital in this situation? (*Hint:* The marginal product of capital may be computed using calculus by differentiating the production function and using the capital–output ratio or by using the fact that capital's share equals MP_K multiplied by K divided by Y.)

$\mathbf{MP_K = 0.4AK^{-.6}L^{.6} = 0.4A(K/L)^{-.6} = 0.4A(L/K)^{.6} = 0.4(Y/K)}$

$MP_K = 0.4(Y/K) = 0.4(1/5) = \mathbf{0.08}$ (as (K/Y) = 5 implies that (Y/K) = 1/5)

B) If the economy is in a steady state, what must be the saving rate?

In a SS, (Actual Inv) = (Breakeven Inv) = $s \cdot Y = (n + g + \delta) \cdot K$

So, $\mathbf{s} = (n + g + \delta) \cdot (K/Y) = (1\% + 4\% + 2\%) \cdot (5) = (0.07) \cdot (5) = \mathbf{0.35}$

C) If the economy decides to achieve the Golden Rule level of capital and actually reaches it, what will be the marginal product of capital?

In a Golden Rule SS it is also true that: $\mathbf{MP_K} = (n + g + \delta) = \mathbf{0.07}$

D) What must the saving rate be to achieve the Golden Rule level of capital?

In a SS, (Actual Inv) = (Breakeven Inv) = $s \cdot Y = (n + g + \delta) \cdot K$

So, $s = (n + g + \delta) \cdot (K/Y)$

Since we know that $MP_K = (n + g + \delta) = 0.07 = 0.40(Y/K)$ then in the Golden Rule SS the capital to output ratio (K/Y) must be equal to $(K/Y) = 0.40/0.07 = \alpha/(n + g + \delta) = 5.714285714$.

Therefore, the saving rate (MPS=s) needed to achieve the Golden Rule SS is:

$$\mathbf{s} = (n + g + \delta) \cdot (K/Y)$$
$$= (n + g + \delta)[\alpha/(n + g + \delta)] = \boldsymbol{\alpha} = (0.07) \cdot (0.40/0.07) = \mathbf{0.40}$$

Alternatively:	$MP_K = (n + g + \delta)$	at a Golden Rule SS
	$s \cdot Y = (n + g + \delta) \cdot K$	at any SS
So	$MP_K \cdot K = s \cdot Y$	
	$0.40(Y/K) \cdot K = s \cdot Y$	as $MP_K = 0.40(Y/K)$
	$0.40 \cdot Y = s \cdot Y$	So clearly $\mathbf{s = \alpha = 0.40}$