Your ECO100 Number:_____

Term Test 3: Form Code: **A**: 2014–2015
Solutions: **Full**

While you wait for the exam to start, please fill in the information below and complete the FRONT and BACK of the Bubble Form.
DO NOT OPEN THIS TEST BOOKLET UNTIL INSTRUCTED.

Family Name: _____

Given Name: _____

UofT Student Number: _____

Which lecture will you attend on Monday, March 9?
Your test will be returned to you in the section you indicate.

◯ 12:00 PM – 1:00 PM (L0201) ◯ 1:00 PM – 2:00 PM (L0301)

Code of Conduct

With my signature below, I attest to understanding the University of Toronto's *Code of Behaviour on Academic Matters*, and promise my adherence for the good of my community.

Signature: _____

General Instructions

1. 105 minutes. 110 points. Allocate your time wisely!
2. Aids allowed: a simple (i.e., non-graphing, non-programmable) calculator.

Bubble Form Instructions

- Answer MULTIPLE CHOICE questions on supplied bubble form.
- **Fill in all information on both sides of the bubble form.**
- Your Form Code is **A**.
- Pencil recommended for bubble form. Black or blue ink can be used, but not erased!
- Each Multiple Choice question is worth 3 marks. No deductions for incorrect answers.
- Multiple choice marks are based *entirely* on the bubble form.
  Any writing in this test booklet will **not** be considered.

Please Do Not Write in this Space

Part	I	_____/ 52 Marks	Page	11.	_____/ 13 Marks
Page	8.	_____/ 10 Marks	Page	12.	_____/ 12 Marks
Page	9.	_____/ 10 Marks			
Page	10.	_____/13 Marks	**Total**		_____/**110 Marks**

FORM CODE A

I. **[52 Marks]** Multiple Choice Questions: Indicate answer on bubble form.

1. **[1 Marks]** Look up a couple of centimetres. What is your Form Code?
   A. A
   B. B
   C. C
   D. D

Q	**1**	**2**	**3**	**4**	**5**
Florence	\$10	\$8	\$6	\$4	\$2
Genzebe	\$7	\$6	\$5	\$4	\$3

Table 1: Marginal willingness to pay as a function of quantity for two consumers.

2. **[3 Marks] Refer to Figure 1.** Assume the good in question is non-rival but excludable and can be produced at a marginal cost equal to \$4.50. What is the efficient quantity?
   A. 1.
   B. 2.
   C. 3.
   D. 4.
   E. 5.

   Solution: **E** As the good is non-rival, in order to maximize surplus we want each unit where the **sum of individual benefits** is at least as large as the marginal cost. The sum of benefits for the fifth unit is \$5.00, which is greater than the cost.

3. **[3 Marks] Refer to Figure 1.** Assume the good in question is rival but **not** excludable and can be produced at a marginal cost equal to \$4.50. What is the efficient quantity?
   A. 2.
   B. 4.
   C. 6.
   D. 8.
   E. 10.

   Solution: **C** As the good is rival, we want any and all units where an **individual's** benefit is at least as large as \$4.50. This is true for the first three units for Florence, as well as the first three units for Genzebe.

4. **[3 Marks]** Lolo is considering a one-year job where there is a 20% chance that her income will be \$50,000 and an 80% chance that her income will be \$100,000. What is the expected value of this job?
   A. \$60,000.
   B. \$75,000.
   C. \$80,000.
   D. \$90,000.
   E. Unable to calculate with information provided.

Solution: **D** $\frac{1}{5}\$50,000 + \frac{4}{5}\$80,000 = \$90,000$

5. **[3 Marks]** Heisenberg has diminishing marginal utility of income. He must choose between two one-year jobs. **Job A:** 50% chance that income is \$50,000 and a 50% chance that income is \$150,000. **Job B:** \$100,000 for certain. Which of the following is true under our standard assumptions?

   A. Heisenberg is indifferent between **Job A** and **Job B**.
   B. Heisenberg prefers **Job A**.
   C. Heisenberg prefers **Job B**.
   D. We cannot determine with the information provided.
   E. Prof. Gazzale is approximately 7-feet tall.

   Solution: **C** Diminishing marginal utility (+ Expected Utility hypothesis) $\Rightarrow$ risk aversion (i.e., will take \$X for certain over a gamble whose expected value is \$X)

6. **[3 Marks]** Which of the following is an example of screening in an attempt to solve an information asymmetry?

   A. Stringer pays a \$110 premium for an insurance policy that he expects will payout \$100.
   B. Avon divides his retirement assets over many stocks as opposed to putting them all in one stock.
   C. Omar's auto insurance premium is higher than average because he is a young, unmarried male.
   D. Marlo knows that he will not receive unemployment payments if he loses his job because he was a poor worker.
   E. All of the above.

   Solution: **C** With screening, a person's actual riskiness is hidden, but the other side of the transaction can see some attribute or characteristic correlated with the person's actual riskiness. While an insurance company may have a hard time knowing Omar's likelihood of getting into an accident, they know that on average, young males have a relatively high likelihood of accident and therefore must pay more for insurance.

7. **[3 Marks]** Assume a perfectly competitive labour market under the standard assumptions. Many people have a reasonable percentage of their wealth in stocks. What will be the effect of a large and assumed to be permanent decrease in the value of stocks?

   A. $\uparrow Q_{\text{labour}}$; $\uparrow$ equilibrium wage.
   B. $\uparrow Q_{\text{labour}}$; $\downarrow$ equilibrium wage.
   C. $\downarrow Q_{\text{labour}}$; $\uparrow$ equilibrium wage.
   D. $\downarrow Q_{\text{labour}}$; $\downarrow$ equilibrium wage.
   E. Unable to determine as the income and substitution effects may work in opposite directions.

   Solution: **B** In this case, we are decreasing wealth, but not increasing the wage rate, so there will be no substitution effect. A decrease in wealth will shift down (i.e., decreased wage) and out (i.e., increase Q_{labour}) the labour supply curve.

8. **[3 Marks]** The government of Boblandia imposes a per-unit tax on the purchase of new automobiles. Assuming all *labour* markets in Boblandia are perfectly competitive, what is the expected outcome in this labour market under standard assumptions?

A. ↑ equilibrium wage. ↑ average labour productivity.
B. ↑ equilibrium wage. ↓ average labour productivity.
C. ↓ equilibrium wage. ↑ average labour productivity.
D. ↓ equilibrium wage. ↓ average labour productivity.
E. It depends on whether or not the market for automobiles is assumed to be perfectly competitive.

Solution: **C** Regardless of whether the auto market is perfectly competitive or a monopoly, the tax decreases the per-auto amount received by auto manufacturers. This shifts down and in the demand for labour (i.e., the value of the marginal product of labour decreases). Wages go down, and fewer workers are hired. Under the assumption of diminishing marginal product, the workers losing their jobs were less productive than average, and thus average productivity goes up.

9. **[3 Marks]** Roger can choose to work as many hours as he likes. His hourly wage rate increases, and he responds by working fewer hours. How does the standard labour supply model explain this?

A. The increase in wage rate caused a shift in of Roger's labour supply curve.
B. The substitution effect, pushing him to work more hours, was smaller than the income effect.
C. The income effect, pushing him to work more hours, was smaller than the substitution effect.
D. Leisure must be an inferior good for Roger.
E. Roger's behaviour is inconsistent with the standard labour supply model.

Solution: **B** Leisure is more expensive, meaning that the substitution effect pushed him to work more hours. The standard (and very good) assumption is that leisure is a normal good. An increase in wage rate means that any particular number of hours worked, he has more income, and thus the income effect pushes him to work less. The two effects work in opposite directions, and as Roger worked less, this means the latter had to be larger than the former.

10. **[3 Marks]** Which of the following is the best example of a compensating differential.

A. Tyrion puts in consistently high effort because he does not want to lose his job paying him an above-market wage.
B. Jon Snow receives a high wage because of the low supply of people willing to work outside in sub-zero temperatures.
C. Although Arya sings only slightly better than Sansa, she makes 100 times as much from YouTube videos.
D. Oberyn only hires women because his customers prefer dealing with women.
E. Catelyn will only work for a high wage because she has a high opportunity cost for her time.

Solution: **B** "Compensating differentials" is just the fancy economic term for the fact that the supply of labour shifts in response to the desirability of a job.

11. **[3 Marks]** Both Don and Peggy believe inflation will be 5% per year for the next few years. Don rents office space from Peggy, and must pay her $20,000 on the first day of March in 2015, 2016 and 2017. What if inflation is only 2.5% per year for the next few years?

A. The real value of the final payment will be higher than the nominal value of the first.
B. Both Don and Peggy are better off than expected.
C. Both Don and Peggy are worse off than expected.
D. Don is better off than expected. Peggy is worse off than expected.
E. Don is worse off than expected. Peggy is better off than expected.

Solution: **E** Inflation erodes the purchasing power of nominal dollars. Less inflations means the purchasing power future nominal dollars is less eroded. Peggy, who gets these future dollars is better off, while Don is worse off because he has to give up more real purchases. Numerically, let us only consider year 1. Both Don and Peggy expect Don's 2016 payment to be worth $\frac{\$20,000}{1.05} \approx \$19,047.62$ in 2015 dollars. It is actually worth $\frac{\$20,000}{1.025} \approx \$19,512.20$. Peggy is better off, Don is worse off.

date	item	value
1-Jan-2014	Value of Machines	$100,000
2014	Depreciation of Machines	$20,000
31-Dec-2014	Value of Machines	$140,000
1-Jan-2014	Value of Inventory	$80,000
31-Dec-2014	Value of Inventory	$75,000

Table 2: Numbers related to BobCo's investment expenditures in 2014.

12. **[3 Marks] Refer to Table 2** Based only on the information presented in the table, what was BobCo's contribution to GDP in 2014?

A. $35,000.
B. $45,000.
C. $55,000.
D. $115,000.
E. $135,000.

Solution: **C** First, BobCo purchase some machines. Had it not purchased any machines, its machines would have been worth $100,000-$20,000=$80,000. As it had actually had $140,000 in machines, it must have purchased $60,000 worth of machines. Its inventory decreased by $5,000, meaning that BobCo's investments were $60,000-$5,000=$55,000.

13. **[3 Marks]** Assume that in 2015 and 2016, GM Canada sells 10,000 cars and GM receives $20,000 per car. (That is, the retail or sticker price of each car is $20,000.) Which of the following would result *directly* in an increase in the GDP created by these cars?

A. A 2016 increase in Canada's sales tax rate (i.e., GST).
B. A decrease in the rate at which GM's profits are taxed.
C. A decrease in the rate at which GM's workers' earnings are taxed.
D. An increase in the rate at which GM's machines depreciated.
E. Switching from purchasing glass from a Canadian company in 2015 to making its own glass in 2016.

Solution: **A** An increase in a sales tax rate means more money out of consumers pockets. At the current 13% rate, a $20,000 car counts for $\$20,000 \times 1.13 = \$22,600$ in

GDP. If the rate increased to 15%, a \$20,000 car counts for $\$20,000 \times 1.15 = \$23,000$ in GDP.

14. **[3 Marks]** In Boblandia, the GDP deflator was 110 in 2004 and 121 in 2005. If nominal GDP was 134,310 in 2005, what was real GDP in 2005?

    A. 100,000.
    B. 111,000.
    C. 122,000.
    D. 122,100.
    E. Unable to determine with given information.

    Solution: **B** Deflator $= \frac{\text{Nominal}}{\text{Real}} \times 100 \Rightarrow \text{Real} = \frac{\text{Nominal}}{\text{Deflator}} \times 100 = \frac{134{,}310}{121} \times 100 = 111,000$

Year	CPI
1999	70
2000	80
2001	85
2002	100
2003	105

Table 3: CPI values. **Assume that the CPI is measured on December 31 of a given year.**

15. **[3 Marks] Refer to Table 3** What was inflation in 2001?

    A. $\frac{100-80}{100} = 20\%$
    B. $\frac{100-85}{100} = 15\%$
    C. $\frac{85-80}{80} = 6.25\%$.
    D. $\frac{85-80}{85} = 5.88\%$
    E. $\frac{85}{100} - \frac{80}{100} = 5\%$.

    Solution: C

16. **[3 Marks] Refer to Table 3** What nominal amount of money on December 31, 1999 gave the same purchasing power as \$4,050 on December 31, 2003?

    A. \$2,700
    B. \$3,000
    C. \$3,300
    D. \$3,857.40
    E. \$4,015

    Solution: **A** The CPI (and thus the price of an average basket of goods) increased by $\frac{105-70}{70} = 50\%$ from 1999 to 2003. We have $\text{Nominal}_{1999} \times 1.5 = \text{Nominal}_{2003}$, or $\text{Nominal}_{1999} = \frac{\$4050}{1.5} = \$2,700$.

17. **[3 Marks]** Consider the income-expenditure (Keynesian) model. With Y^D equal to disposable income, the consumption function is $C = 100 + \frac{3}{4}Y^D$. The marginal tax rate is $\frac{1}{5} = 20\%$. Assuming marginal propensity to import is zero, what is the increase in private savings as a result of a \$10 billion increase in autonomous investment?

    A. \$2.5 billion.

B. \$5 billion.

C. \$6.25 billion

D. \$5.5 billion

E. \$10 billion.

Solution: **B** The expenditure multiplier is

$$\frac{1}{1-(1-\tau)c} = \frac{1}{1-\frac{4}{5}\times\frac{3}{4}} = \frac{1}{1-\frac{3}{5}} = \frac{1}{\frac{2}{5}} = \frac{5}{2}.$$

A \$10 billion dollar increase in autonomous investment boost real GDP by \$25 billion. The government takes 20%, meaning disposable income has increased by \$20 billion. As consumers spend 75% of any increase in disposable income, they save 25% of any increase, meaning savings increase by \$20 billion $\times \frac{1}{4} =$ \$5 billion.

18. **[3 Marks]** Government savings equals $\frac{1}{5}Y - 10000$. When disposable income increased from 800 to 880, private savings increased from 60 to 90. According to the standard income-expenditure (Keynesian) model without imports, what will be the increase in real GDP resulting from a 420 increase in autonomous consumption?

A. 480.

B. 525.

C. 840.

D. 1120.

E. 2100.

Solution: **C** The marginal tax rate is $\frac{1}{5}$. The marginal propensity to consume is $\frac{80-30}{80} = \frac{5}{8}$. The expenditure multiplier is thus

$$\frac{1}{1-(1-\tau)c} = \frac{1}{1-\frac{4}{5}\times\frac{5}{8}} = \frac{1}{1-\frac{1}{2}} = \frac{1}{\frac{1}{2}} = 2.$$

The multiplier is thus 2, resulting in an increase in real GDP equal to 840.

USE A PEN FOR THE FOLLOWING SECTIONS

II. **[20 Marks]** For each of the following, indicate **True**, **False** or **Uncertain** and concisely explain. All of the marks are earned for the explanation.

(1) **[5 Marks]** Assume a perfectly competitive labour market. Kil Sang uses both machines and workers to produce his output. Over time, there is an improvement in the machines he uses. **TFU:** Assuming no other changes, this improvement in machines causes him to hire fewer workers.

Solution: Uncertain It depends whether machines and labour are substitutes or complements. If complements (e.g., one machine per worker), an improvement in machines will make workers more productive, thus shifting labour demand (i.e., *VMPL*) up and out. If substitutes (e.g., self-checkout scanners at the grocery store), this decreases demand for workers.

(2) **[5 Marks]** Assume no changes in demographics (i.e., the total population, and the number of people in each age group remains constant). Spain's economy currently faces a recessionary gap (i.e., current real GDP is less than potential GDP). **TFU:** If the unemployment rate increases this month, this means that the economy is not improving.

Solution: Uncertain While it could be an increase in cyclical unemployment, it could also be an increase in frictional unemployment. There are two possibilities (you just need to mention one of them). First would be an increase in the labour force participation rate due to an improving economy.[1] In other words, as workers are less discouraged about the possibility if finding a job, so they transition from "not working, not searching" to "not working but searching." Second might be an increase in voluntary quits. If people believe the job market is improving, they are more likely to quit their current job and search for a new one.

(3) **[5 Marks]** In 2012, Gazzalestan appropriately fixes the basket of goods used to calculate its CPI. From 2012 to 2015, the price of coffee increased 15%. **TFU:** Because consumers will substitute away from coffee as a result of this price increase, the CPI to will overstate the true increase in the cost of living from 2012 to 2015 for an average resident of Gazzalestan.

Solution: Uncertain While we know that the price of coffee increased by 15%, we do not know the price change of substitutes. If the price of tea, for example, increased by 30%, we might expect people to substitute towards coffee, in which case the substitution bias says the CPI to will overstate the true increase in the cost of living from 2012 to 2015 for an average resident of Gazzalestan because they substitute away from *tea*.

(4) **[5 Marks]** In 2015, Gazzalestan increases autonomous government expenditures. **TFU:** The standard income-expenditure model (with marginal tax rate $0 < \tau < 1$) predicts a decrease in the sum of private and public savings.

Solution: Uncertain The direct effect is a decrease in government savings. The indirect effect stems from the fact that $\uparrow \overline{G} \Rightarrow \uparrow Y^{eq}$, and this increase in real GDP will increase both private savings ($\Delta\overline{G} \times$ expenditure multiplier $\times (1-c)$) as well as government revenues ($\Delta\overline{G} \times$ expenditure multiplier $\times t$).

III. **[8 Marks]** Lobsang gets to choose in which country he will be born. He has a table accurately indicating for each country the average yearly household ***after-tax*** income for each quintile

[1] The labour force participation rate is also affected by demographics. A large cohort of the population entering retirement age will decrease the labour force participation rate.

(i.e., group of 20% of households) of the income distribution. He says to you "I care about inequality. Based on this table, it looks like income inequality in your country is too high given my preferences." Identify and briefly explain, two factors that— if true—would make Lobsang more comfortable choosing your country.

Solution: The four best factors:

- Government provision of services. While income determines what we consume, we also consume goods provided by the government (e.g., schools, healthcare). Under the reasonably good assumption that these government-provided goods are not skewed towards those with a high income, the distribution of consumption will be more even than the distribution of income.
- Equality of opportunity versus equality of outcomes. Some (but perhaps not all) people who care about outcome equality would be less concerned if they found out that all in a society had the same chance to be top earners. We can fold preferences into this factor: we might be less concerned about income inequality if it is true that those at the bottom of the distribution chose more leisure over more money.
- Temporary income shocks. If year-to-year income for an average household has a lot of variability, then the distribution of "income this year" will look worse than distribution of "average income over a few years."
- Life-cycle issues. On average, younger households (i.e, those just starting out in the labour force) and older households (i.e., retired persons) will have lower incomes than households headed by workers in their prime earning years. If your country has a large cohort of twenty-somethings (or retirees), this is going to make income distribution look bad.

For both of these last issues, the underlying issue is that most people are probably more concerned with "lifetime" earnings rather than earnings in a particular year.

IV. **[5 Marks]** Assume salespersons in Toronto have the same preferences towards risk as salespersons in Vancouver. BobCo, located in Toronto, has salespersons in both Toronto and Vancouver. Briefly explain why it would not be surprising if salespersons in Toronto earn a fixed weekly salary (and did not receive a percentage of each sale) and those in Vancouver earn a small fixed salary but do receive a percentage of each sale.

Solution: The one sentence answer: We have a moral hazard problem when effort is hard to monitor, and commissions are a great way to provide incentives for high effort.

The details: In both cases, we want to make it worthwhile to put in high effort. In Toronto, where we can more easily monitor effort, we can offer a salary and threaten to fire the salesperson if she does not exert high effort. In Vancouver, we are more likely to have a moral hazard problem where the salesperson's effort is hidden. We provide incentives for high effort by making the salesperson bear some of the cost when things go wrong (i.e., low commissions).

V. **[13 Marks]** Thuy is starting a company making smart watches! She has paid her manufacturer, and she then paid herself $100,000 (after any taxes). Her manufacturer may need additional money. There is a 60% chance of moderate production difficulties, in which case Thuy, as the owner, will have to pay $40,000 of her own money to cover the costs. There is a 30% chance serious production difficulties, in which case Thuy, as the owner, will have to

pay $100,000 of her own money to cover the costs. The table shows the utility Thuy gets for various levels of income available to spend on consumption.

Consumption Income	Utility
$0	0
$10,000	170
$20,000	320
$30,000	460
$40,000	590
$50,000	710
$60,000	810
$70,000	900
$80,000	970
$90,000	1020
$100,000	1040

(1) **[8 Marks]** An insurance company is willing to sell Thuy "production difficulty insurance," where the insurance company will pay any and all costs associated with production difficulties. Making certain to show all of your work, what is the most that Thuy is willing to pay for this insurance?

Solution:

Expected utility without insurance

$$\frac{3}{10}u(\$0) + \frac{6}{10}u(\$60,000) + \frac{1}{10}u(\$100,000)$$
$$\frac{3}{10} \times 0 + \frac{6}{10} \times 810 + \frac{1}{10} \times 1040 = 590$$

Without insurance, Thuy's expected utility is 590. She just so happens to get 590 units of happiness if her income is certainly $40,000, so she is willing to pay $60,000 for full insurance, in which case she gets $40,000 in income regardless of production difficulties.

(2) **[5 Marks]** If Thuy purchases this insurance at a premium equal to the most she is willing to pay, how much money does the insurance company expect to make?

Solution:

The expected payout is $\frac{3}{10} \times \$100,000 + \frac{6}{10} \times \$40,000 = \$54,000$. The insurance company expects to make $60,000-$54,000=$6,000.

VI. **[12 Marks]** This is what you know about Gazzalestan, with Y^D equal to disposable income.

Consumption $C = 10 + \frac{9}{10}Y^D$

Investment $I = 100$

Government Expenditures $G = 90$

Government Revenues $GR = \frac{1}{6}Y$

Exports $X = 100$

Imports $M = \frac{1}{4}Y$

(1) **[6 Marks]** Calculate equilibrium GDP according to the income-expenditure (Keynesian) model. **Solution:**

$$\begin{aligned}
PAE &= \overline{C} + cY^D + \overline{I} + \overline{G} + \overline{X} - mY \\
&= 10 + \frac{9}{10}(Y(1 - \frac{1}{6})) + 100 + 90 + 100 - \frac{1}{4}Y \\
&= 300 + Y(\frac{3}{4} - \frac{1}{4}) = 300 + \frac{1}{2}Y \\
Y^{eq} &= PAE = 300 + \frac{1}{2}Y^{eq} \\
\frac{1}{2}Y^{eq} &= 300 \\
Y^{eq} &= 600
\end{aligned}$$

(2) **[6 Marks]** What change in Government Expenditures will result in a trade balance equal to zero?

Solution: Currently, Gazzalestan exports 100, and imports $\frac{1}{4} \times 600 = 150$. By the multiplier, each \$1 decrease in $\overline{G}$ decreases GDP by \$2, and by $m = \frac{1}{4}$ each \$2 decrease in GDP decreases imports by \$0.50, meaning that each \$1 decrease in $\overline{G}$ decreases imports by \$0.50. To close the trade gap, we would need to decrease imports by 50, meaning we would need to decrease $\overline{G}$ by 100. (Unfortunately, this is impossible given that $\overline{G} = 90$ ...)