

**INSTRUCTIONS:**

1. Answer ONLY the specified number of questions from the options provided in each section. Do not answer more than the required number of questions. Each section takes one hour.
2. Your answers must be on the paper provided. No more than one answer per page. Do not answer two questions on the same sheet of paper.
3. If you use more than one sheet of paper for a question, write "Page 1 of 2" and "Page 2 of 2."
4. Write ONLY on one side of each sheet. Use only pen. Answers in pencil will be disqualified.
5. Write ----- **END** ----- at the end of each answer.
6. Write your exam identification number in the upper right-hand corner of each sheet of paper.
7. Write the question number in the upper right-hand corner of each sheet of paper.

**Section 3: Applied Economics—Answer Any Two Questions.**

**3A.** (Econ 212: Brady and Lombardi) Distinguish carefully between extensive growth and intensive growth, and between Smithian growth and Promethean growth. Describe and contrast specific examples of both Smithian growth and Promethean growth in the *developing* world, either during the period since 1950 or a shorter period within that era.

**3B.** (Econ 138: Liu) Answer all parts of this question:

- a. Write down an ARIMA(2, 1, 2) model using backshift notation.
- b. Assuming we have observations up to time T, use the model in the previous question to illustrate the steps to calculate point forecasts for period T+1, T+2, and T+3.
- c. When fitting an ARIMA model to a seasonal time series, what are the procedures and associated R commands?

**3C.** (Econ 236: Pogodzinski) Under what circumstances is there a "terms of trade effect" due to a tariff? Under these circumstances, how does imposition of a tariff affect the terms of trade? What is an optimal tariff? If an optimal tariff is imposed, who gains and who loses? If an optimal tariff is imposed, is world-wide efficiency enhanced? Explain.

(over)

**3D.** (Econ 221: Holian) In his 1838 book, *Researches Into the Mathematical Principles of the Theory of Wealth*, Antoine Cournot presented models of both horizontal and vertical relationships between firms.

- a. Consider first the horizontal case. Say inverse market demand is given by  $P = 10 - Q$ , where  $P$  is the market price and  $Q$  is total market quantity; there are two firms so  $Q = q_1 + q_2$ , where  $q_1$  and  $q_2$  are the output levels of firms 1 and 2 respectively. Assume both firms have total costs given by  $C_i = q_i$ , where  $i$  indexes firm and  $i \in \{1,2\}$ . Solve for the equilibrium duopoly price. Now say these firms merge. Solve for the equilibrium monopoly price. Compare and contrast the pre- and post-merger prices in the model of horizontal relations.
- b. Turning next to a model of a vertical relationship, let inverse market demand again be given by  $P = 10 - Q$ . However now there is only one firm that sells to consumers, called the retailer. The retailer is thus a monopolist in the final goods market, but it must purchase its merchandise in the wholesale market where there is a single monopolist wholesaler. Assume there are no costs to retailing except for the cost of merchandise. For the wholesaler assume fixed and variable costs of production are zero. Solve for the equilibrium retail price. Now say these firms merge. Solve for the equilibrium retail price. Compare and contrast the pre- and post-merger prices in the model of vertical relations.
- c. Finally in a sentence, contrast the effect of merger in a model of horizontal relations with the effect of merger in a model of vertical relations.

**3E.** (Econ 232: Foldvary) Do both parts **a** and **b**:

a. Define “productive investment” as an increase in the stock of capital goods and human capital which results in an increase in productivity, such that the net benefits are positive, and greater than those of alternative investments. Since government revenues and spending are fungible, i.e. spending can be shifted among programs, explain whether there is any difference in the effect on the economy, and on the incidence of the borrowing, if the government borrowing is spent on useful consumption versus productive investments.

b. Is there any difference for the economy if federal government borrowing is from domestic versus foreign bond buyers?

**3F.** (Econ 251 [formerly Econ 250]: Deyo) Illustrate the cobweb model, labeling everything. Then answer the following:

- a. What are the three types of expectations associated with this model? Define and explain the expectations *in detail*.
- b. Relate the implications of this model to firms seeking high-skilled immigrant labor. What factors would influence the trade-off between domestic and immigrant labor in this type of market? Are there other models that might inform the analysis of these trade-offs? Discuss.
- c. Describe at least three other factors which would aggravate the problems presented in the cobweb model beside those listed in part **b**. Be specific and be sure to use the proper names; *do not generalize*. Explain the dynamics of how these problems would worsen the outcomes of the cobweb model.

**3G.** (Econ 166: Pogodzinski) Derive (using graphical or algebraic methods) the housing-price curve in Brueckner's Simple Urban Model. What conclusions about the shape of the housing price curve, the slope of the housing price curve, and total expenditures on housing (total rent) are supported by the Simple Urban Model? Explain how the edge of the city is determined in the Simple Urban Model. What is the effect of a higher  $t$  (marginal cost of commuting) on the allocation of land to housing and farming in Brueckner's Simple Urban Model? Why do the poor reside closer to the CBD in Brueckner's Simple Urban Model?

**3H.** (Econ 241 [formerly Econ 200]: Deyo) In his paper "The Problem of Social Cost," Ronald Coase suggested that all externalities are reciprocal and offered insights for law and economics based on that insight. Consider the following problem: Joe installs solar panels on his house to generate sustainable energy. However, his neighbor Marie has already planted redwood trees all around her property line in an effort to reduce the greenhouse effect. Both individuals have environmentally friendly policies in mind, but Marie's redwood trees are blocking the sun from Joe's solar panels.

- a. State the full Coase Theorem with both zero and positive transaction costs.
- b. What concerns might Coase have about a Pigouvian tax approach to this problem?
- c. Assume that the court grants Joe the property right for unobstructed solar panels but that Joe and Marie are willing to negotiate afterwards. This produces the following gains for each party where "Cut Trees" means Marie cuts down the trees and "Keep Trees" means Joe's solar panels remain in the shade. Complete the table and identify the socially optimal outcome:

	Cut Trees	Keep Trees	MC or MB
Joe's Gains	\$250/month	\$125/month	
Marie's Gains	\$150/month	\$300/month	
Total Gains			

- d. What is the price range for the socially optimal outcome? Does evidence support the likelihood of this outcome?

**3I.** (Econ 281: Liu) Answer all parts of this question:

- a. Explain the differences between the reduced form VAR and structural VAR models.
- b. What is an error correction model (ECM)? Explain the Engle and Granger 2-step approach to estimate an ECM.
- c. When forecasting a set of time series using a vector error correction model (VECM), what are the procedures? (It's not necessary to provide the specific R commands.)