

EXAMINATION 4 VERSION B
“Economic Regulation”
May 2, 2017

INSTRUCTIONS: This exam is closed-book, closed-notes. Simple calculators are permitted, but graphing calculators or calculators with alphabetical keyboards are NOT permitted. Mobile phones or other wireless devices are NOT permitted. Fractional answers are acceptable. Decimal answers, if rounded, must be correct to at least three significant digits. Points will be subtracted for illegible writing or incorrect rounding. Point values for each question are noted in brackets.

I. Multiple choice: Please circle the one best answer to each question. [1 pt each, 21 pts total]

- (1) The principle that a regulated firm "is entitled to ask for a fair return" on investment was established by the Supreme Court in the case of
- Standard Oil v. United States.
 - United States v. United Shoe.
 - Nebbia v. New York.
 - Smyth v. Ames.
- (2) Social deadweight loss is minimized when price is set equal to
- average fixed cost.
 - marginal cost.
 - average variable cost.
 - average total cost.
- (3) In Ramsey pricing, as in market-segmenting price discrimination, the market segment with less-elastic demand gets
- the smaller price-cost margin.
 - the larger price-cost margin.
 - the same price-cost margin, assuming marginal costs are identical.
 - cannot be determined from information given.
- (4) The *rate base* for a regulated public utility is
- the monthly service fee for its lowest-price customers.
 - the number of customers it serves.
 - the minimum usage price it may charge.
 - the value of its plant and equipment.
- (5) Under price-cap regulation, the utility's prices are set
- to cover the utility's expenses plus an allowed rate of return on the rate base.
 - to match those of its competitors.
 - to increase with the rate of inflation, less adjustments for industry productivity growth.
 - to match the price of hats.
- (6) A barrier to peak-load pricing for electric power in practice is that
- the relevant economic theory is not yet developed.
 - not enough electric power is available.
 - sophisticated usage meters are not installed.
 - demand for power fluctuates during the day and over the year.
- (7) To sell electricity in wholesale markets, an electricity producer must
- be regulated by a state commission.
 - have retail customers.
 - be owned by a local government.
 - all of the above.
 - none of the above.
- (8) Assume that in some wholesale electricity market, all producers are paid the same equilibrium price, and that no firm has the ability to manipulate the final price. Then each firm's optimal bid is
- greater than its true marginal cost.
 - equal to its true marginal cost.
 - less than its true marginal cost.
 - zero.

(9) Even if a wholesale electricity market is functioning perfectly, the price of electricity may be higher in one location than others if

- that location does not use peak-load pricing for retail customers.
- that location has fewer generators than others.
- that location has greater demand for electricity than others.
- transmission lines going into that location are at maximum safe capacity.

(10) One lesson from the California electricity crisis of 2000-2001 is that if retail electricity prices are fixed but wholesale prices fluctuate,

- generators may malfunction, causing a blackout.
- transmission lines may develop excess capacity.
- utilities are forced to bear too much price risk.
- retail customers are forced to bear too much price risk.

(11) Spot prices for wholesale electricity are volatile during peak periods because wholesale

- demand is price-elastic but supply is inelastic.
- supply is price-elastic but demand is inelastic.
- demand and supply are both price-inelastic.
- demand and supply are both price-elastic.

(12) Wholesale electricity demand is extremely price-inelastic if

- there is excess capacity on transmission lines.
- there is excess generating capacity throughout the system.
- wholesale price fluctuations are passed through to retail customers.
- retail customers are insulated from wholesale price fluctuations.

(13) Which of the following changes would *not* reduce market power in wholesale electricity markets?

- Requiring large producers to sell most of their power through long-term forward contracts.
- Using “pay as bid” prices to compensate power producers.
- Implementing flexible pricing at the retail level.
- Connecting more power producers to the system.

(14) Cross-subsidization between markets causes deadweight loss in

- the market priced below cost.
- the market priced above cost.
- both markets.
- None of the above.

(15) Workers in regulated industries typically earn wages that are

- below minimum wage.
- higher than similar workers in other industries.
- identical to similar workers in other industries.
- lower than similar workers in other industries.

(16) Economists seeking to measure the effects of regulation must always deal with the

- complete absence of relevant data.
- inability to perform controlled experiments.
- lack of theories to test.
- lack of examples of unregulated markets.

(17) Which industry was regulated first in the United States?

- Airlines.
- Railroads.
- Trucking.
- All three industries were regulated simultaneously.

(18) Why was trucking regulated?

- Shippers lobbied heavily for regulation of trucking.
- Trucking is a natural monopoly.
- Railroads were losing money.
- Informal cartels had been keeping rates above competitive levels.
- All of the above.

(19) One effect of railroad deregulation was

- an increase in the number of communities served.
- an increase in railroad profits.
- a shift in traffic from bulk commodities to manufactures.
- a decrease in spending on track, structures and rolling stock.

(20) Deregulation of interstate trucking caused the price of backhauls to

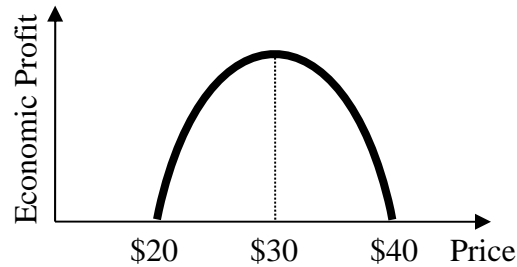
- rise.
- stay constant.
- fall.
- fluctuate randomly.

(21) From 1938 when the Civil Aeronautics Board was created to 1978 when the Airline Deregulation Act was passed, the CAB received 79 applications for new trunk airlines. How many applications were approved?

- a. 0.
- b. 5.
- c. 12.
- d. 39.
- e. 79.

II. Problems: Insert your answer to each question in the box provided. Use margins and graphs for scratch work. Only the answers in the boxes will be graded. Work carefully—partial credit is not normally given for questions in this section.

(1) [Theories of regulation: 3 pts] The following graph relates the economic profit of a regulated monopoly to its price. Assume that the monopoly's average cost and marginal cost both equal \$20.

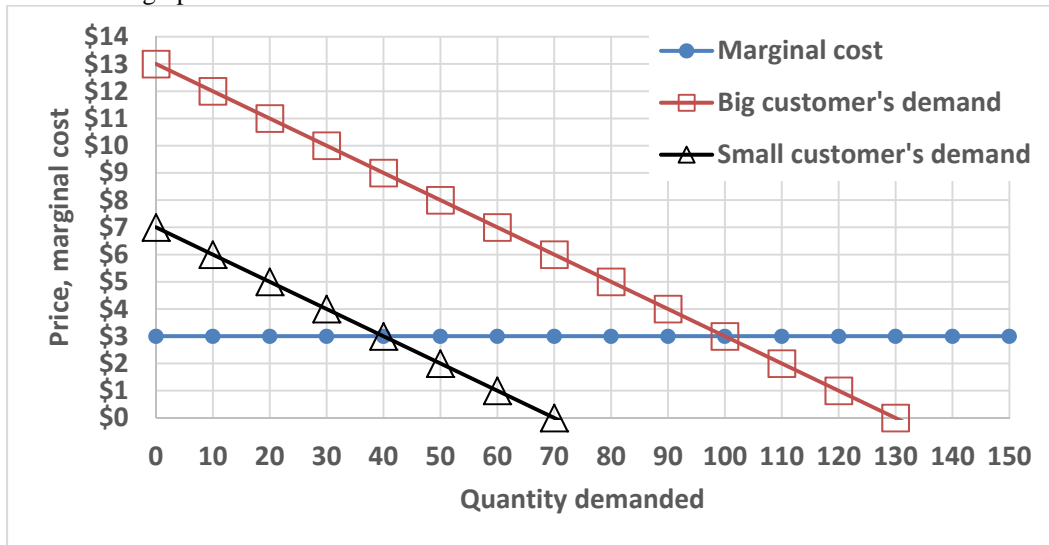


- a. What price will be set by the regulatory agency, according to the “capture theory” of regulation?
- b. What price will be set by the regulatory agency, according to the “public interest theory” (also called the “normative analysis as positive theory”) of regulation?
- c. What price will be set by the regulatory agency, according to the Stigler-Peltzman theory of regulation¹?

\$
\$
\$

¹ George J. Stigler, “The Theory of Economic Regulation,” *Bell Journal of Economics and Management Science*, vol. 2 (Spring 1971), pp. 3-21. Sam Peltzman, “Toward a More General Theory of Regulation,” *Journal of Law and Economics*, vol. 19 (August 1976), pp. 211-240.

(2) [Multipart tariffs: 26 pts] Suppose a regulated firm has a marginal cost (= average variable cost) of \$3. In addition to the marginal cost shown in the graph below, the firm has "fixed" or overhead costs of \$100 million per month. The firm serves both big customers and customers. Their representative individual monthly demand curves are also shown in the graph.



Consider two alternative tariffs:

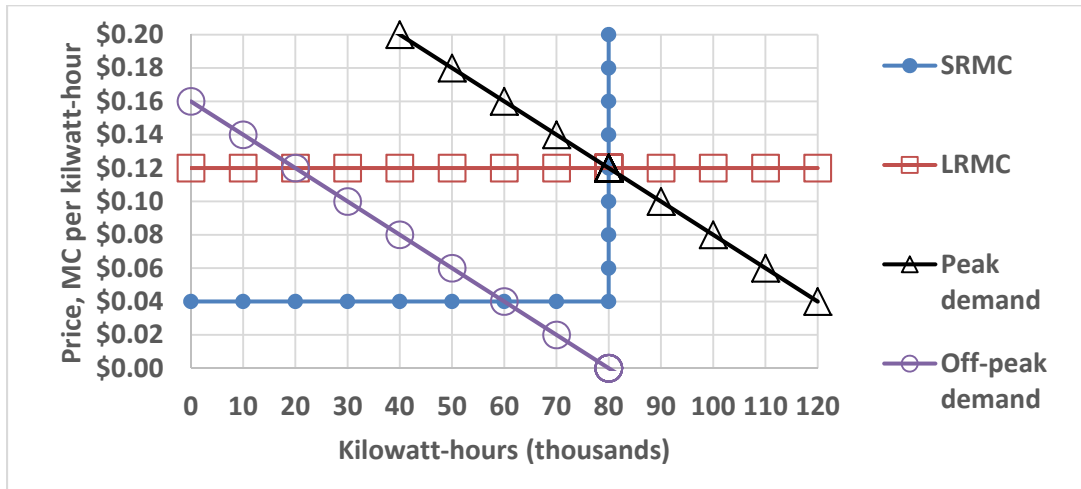
- (i) **Two-part tariff.** Each customer must pay an entry fee (or monthly charge) of \$100 and a per-unit usage charge of \$3 per unit.
- (ii) **Declining-block tariff.** Each customer must pay \$4 per unit for the first 70 units purchased, and \$3 per unit thereafter.

Assume there are one million big customers and one million small customers. Compute the following.

	(i) Two-part tariff	(ii) Declining-block tariff
a. What quantity would a typical big customer buy?	units	units
b. What quantity would a typical small customer buy?	units	units
c. Compute the firm's total revenue.	\$ million	\$ million
d. Compute the firm's total cost (including the "fixed" cost).	\$ million	\$ million
e. Does the firm make a profit, a loss, or just break even?		
f. Compute the social deadweight loss from this pricing policy.	\$ million	\$ million

g. Which of these tariffs do you favor? Why?

(3) [Peak-load pricing: 22 pts] Suppose cost and demand for electricity are given by the following graph. Costs are shown as short-run marginal cost (SRMC) and long-run marginal cost (LRMC) curves. LRMC includes the cost of building new capacity. Demands are shown as peak demand and off-peak demand. Assume for simplicity that peak and off-peak periods are the only periods, and they are of equal duration.



a. Explain in words why SRMC bends up vertically at 80 thousand kilowatt hours.

First, suppose efficient peak-load pricing is used.

- b. Find the price of electricity during the peak period.
- c. Find the quantity of electricity demanded during the peak period.
- d. Find the price of electricity during the off-peak period
- e. Find the quantity of electricity demanded during the off-peak period.

\$	per kWh
	thousand kWh
\$	per kWh
	thousand kWh

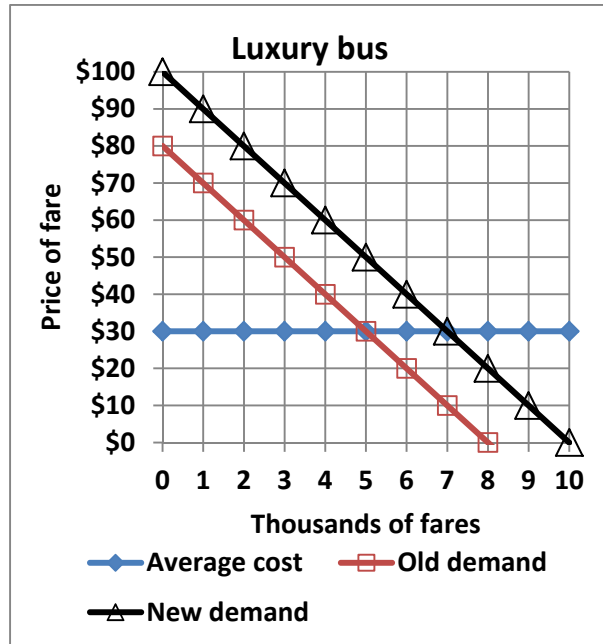
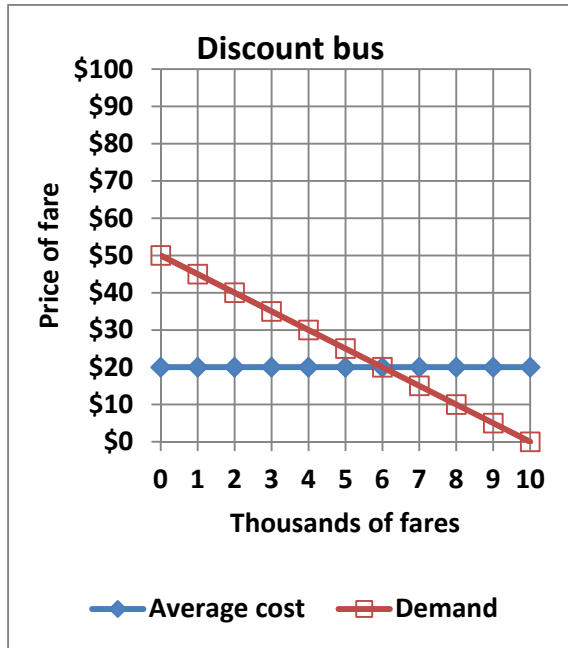
Now suppose instead a uniform price of **\$ 0.10** per kilowatt-hour is used in both peak and off-peak periods.

- f. Find the quantity of electricity demanded during the peak period.
- g. Find the quantity of electricity demanded during the off-peak period.
- h. Would generation capacity have to *increase, decrease, or stay the same* to accommodate uniform pricing?
- i. By how much?
- j. In the graph above, shade the areas representing social deadweight loss from uniform pricing.
- k. Compute the social deadweight loss from uniform pricing.

	thousand kWh
	thousand kWh
	thousand kWh

\$	thousand
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(4) [Effect of regulation on quality: 14 pts] The following graphs show demand and supply for discount and luxury bus rides to Kansas City. Assume average cost also equals marginal cost.



First, consider the market without regulation.

a. Find the quantity of discount bus fares purchased.

	thousand
	thousand

b. Assume the demand for the luxury bus is given by "Old demand." Find the quantity of luxury bus fares purchased.

Suppose a price floor of \$ 60 is imposed on discount bus fares.

c. Find the new quantity purchased of discount bus fares.

	thousand
	\$ thousand

d. Compute the social deadweight loss in the low-quality market from the price floor.

The discount bus and the luxury bus are substitutes, so when the price of discount fares is raised, demand for the luxury bus shifts right to "New demand." Suppose the same price floor of \$ 60 is now also imposed on luxury bus fares.

e. Find the new quantity purchased of luxury bus fares.

	thousand
	\$ thousand

f. Compute the social deadweight loss in luxury bus market from the price floor.

g. Compute the total cost of regulation—that is, the social deadweight loss in the discount bus market plus the social deadweight loss in the luxury bus market.

	thousand
	\$ thousand

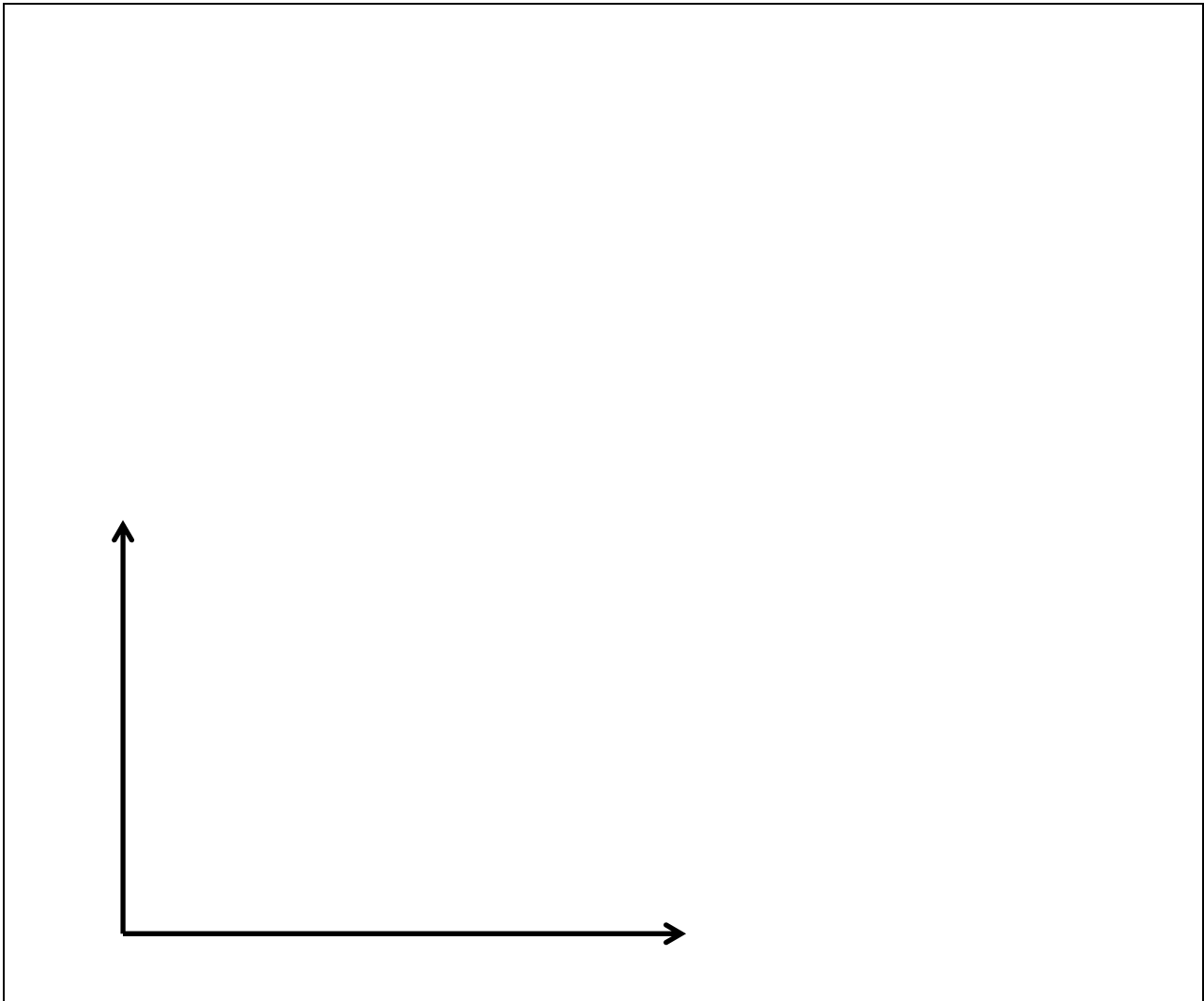
III. Critical thinking: Write a one-paragraph essay answering *just one* question below (your choice). Full credit requires correct economic reasoning, legible writing, good grammar including complete sentences, and accurate spelling. [6 pts]

(1) The same classrooms at Drake University are used both for regular-term courses and for summer-term courses. These classrooms are always occupied during the regular term but they are mostly empty during the summer term.

- a. Are Drake classrooms a *joint cost* or a *common cost*ⁱ for regular-term courses and summer-term courses? Why? Justify your answer and illustrate it with a production-possibility curve. (Label the axes.)
- b. Assume that Drake wants to set tuition so as to price courses at marginal cost. Should the cost of classrooms be included in regular-term tuition only, in summer-term tuition only, or both? Why?

(2) An important concept in the economics of antitrust and regulation is that of *subadditive cost functions*.

- a. Give the mathematical definition of a subadditive cost function $TC = f(q)$. [Hint: This involves an inequality.]
- b. Prove that the cost function $TC = 3 + 2q$ is subadditive.



[end of exam]

ⁱ Use Kahn's definitions of *common cost* and *joint costs*. Alfred E. Kahn, *The Economics of Regulation: Principles and Institutions*, Volume 1, New York: Wiley, 1970, pp.78-79.