



# AMERICAN UNIVERSITY OF BEIRUT

School of Business



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MID-TERM EXAM April 9, 2003

ANSWER ALL QUESTIONS – TIME ALLOWED: 1 ½ hour

I. Multiple Choice – (30 points). Circle the correct answer

1. The modern theory of the firm postulates that the primary objective of managers is to maximize:

- a. The firm's total revenue
- b. The value of the firm's output
- c. The present value of the firm's expected future profits
- d. The firm's contribution to social welfare
- e. The wealth of the firm's employees and customers.

2. Which of the following is the best definition of economic profits?

- a. Business profit minus implicit costs
- b. Total revenue minus total explicit costs
- c. Total revenue minus total implicit costs
- d. Business profit minus explicit costs
- e. Explicit revenues minus implicit costs

3. If the price of a good increases while the quantity of the good exchange on markets increases also, then the most likely explanation is that there has been:

- a. An increase in demand
- b. A decrease in demand
- c. An increase in supply
- d. A decrease in supply
- e. A decrease in demand accompanied by an increase in supply

4. If marginal revenue is equal to zero, then:

- a. Total profit is zero also
- b. Average revenue is zero also
- c. Total revenue is at a maximum
- d. Average revenue is at a maximum
- e. Total cost is at a minimum

5. Assuming a demand function of the form  $Q = 24 - 2P$ . At  $P = 6$ , the price elasticity of demand is:

- a. -2.
- b. -1.
- c.  $-\frac{1}{2}$
- d.  $\frac{2}{6}$
- e. There is not enough information to arrive at an answer.

$$Q = 24 - 2P$$

$$P = 6 \Rightarrow Q = 24 - 2(6) = 12$$

$$\epsilon = -2 \times \frac{6}{12} = -1$$

$$\epsilon = b \times \frac{1}{a}$$

$$= -2 \times \frac{6}{12}$$

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2.00

IL 5/2  
R 2/2

6- As the economic recession worsened in 2001, household income fell by 5%. Over the same period, total expenditures on automobile repairs increased by 3%. Assuming no change in all other economic variables affecting household expenditures:



- a. The income elasticity of demand is equal to 0.6  $\times$
- b. Automobile repairs must be a normal good  $\times$
- c. Automobile repairs must be an inferior good  $\times$
- d. The price elasticity of demand for automobile repairs is equal to  $-5/3$
- e. The price elasticity of demand for automobile repairs is equal to  $-3$ .

7- Application of simple linear regression analysis to the estimation of a demand function yielded the following result:  $Q = 24 - 2P$ . If at the price  $P = 6$ , was  $Q = 10$ , then the error (e) for that price/quantity observation is:

$P = 6$   
 $Q = 12$

- a. zero
- b. 1.
- c. -1.
- d. 2
- e. -2  $\leftarrow e$  is correct.

$e = y - (a - bP)$

$F_c > F_d$

8- If the calculated F-test statistic for a regression is greater than the critical value from the F distribution, it implies that:

- a. None of the independent variables in the regression model have a significant effect on the dependent variable  $\times$
- b. There is no autocorrelation between the independent variables  $\times$
- c. There is no multicollinearity between the independent variables  $\times$
- d. One or more of the independent variables in the regression model have a significant effect on the dependent variable.
- e. We cannot reject the null hypothesis of zero relation between the independent variables and the dependent variable.  $\times$

9- The time series approach to forecasting assumes that:

- a. Random errors terms are normally distributed  $\times$
- b. There are dependable correlations between the variable being forecasted and other independent variables  $\times$
- c. Past patterns in the variable to be forecast will continue into the future.
- d. The data do not exhibit seasonal patterns.
- e. The data do not exhibit cyclical patterns

$\rightarrow$  (some)  $\rightarrow$  (some)

10- Consider the following multiplicative demand function where  $Q_D = 1.6P^{-1.5} Y^{.2}$ .

$E_Y = 0.2$   
 $E_P = -1.5$

- a. for a one percent increase in disposable income, quantity demanded would increase by .2 percent.  $\times$
- b. For a one unit increase in disposable income, quantity demanded income, quantity demanded would increase by .2 units.
- c. For a one percent increase in disposable income quantity demanded would increase by .2 units.  $\times$
- d. For a one unit increase in disposable income, quantity demanded would increase by .2 percent.
- e. None of the above

a is correct  $\rightarrow$

11- A demand function is said to be identified if:

- a. the supply function contains at least one endogenous variable that is not in the demand function
- b. the supply function contains at least one exogenous variable that is not in the demand function
- c. the demand function contains at least one endogenous variable that is not in the supply function
- d. the demand function contains at least one exogenous variable that is not in the supply function.

12- In using regression analysis, the objective is to:

- a. estimate the parameters a and b
- b. estimate the variables Y and X
- c. Fit a straight line through the scatter data in such a way that the errors are minimized
- d. Both a and b
- e. Both a and c

13- The law of diminishing marginal returns:

- a. states that each and every increase in the amount of the variable factor employed in the production process will yield diminishing marginal returns
- b. Is a mathematical theorem that can be logically proved or disproved
- c. Is the rate at which one input may be substituted for another input in the production process
- d. None of the above

14- Which of the following is not an assumption of the linear breakeven model:

- a. Constant selling price per unit
- b. Decreasing variable cost per unit.
- c. Fixed costs are independent of the output level
- d. A single product ( or a constant mix - of products) is being produced and sold
- e. All costs can be classified as fixed or variable

15- In pure competition:

- a. The optimal price-output solution occurs at the point where marginal revenue is equal to price
- b. A firm's demand curve is represented by a horizontal line
- c. A firm is a price-taker since the products of every producer are perfect substitutes for the products of every other producer
- d. a and b only
- e. a, b, and c.

II- True/ False - 20 points. On your blue book, label each of the following statements as either T ( true) or F (false) and briefly justify the answer.

- F 1- The value of a firm is equal to the sum of all future profits that will be generated by the firm
- F 2- Firms that operate in industries with relatively high levels of risk tend to have lower levels of profit.
- F 3- Marginal revenue reaches a maximum at the same level of output at which total revenue reaches a maximum.
- F 4- If an increase in the price of one commodity leads to an increase in the demand for a second commodity, then the two commodities are complements.

F 5- The slope of the demand curve for commodity X represents the price elasticity of demand for commodity X.



T 6- If **Ordinary Least Squares** (OLS) is used to estimate the coefficients of a linear function, then the sum of the  $e_t$  (**error terms**) will always be equal to zero.

F 7- If two forecasting methods are applied to the same data set, the method that yields the larger root-mean-square-error (RMSE) is better.

F 8- If a firm is employing combination of inputs that is on its expansion path then it must be maximizing profits.

T 9- Point of inflection of short-run variable cost function corresponds to level of output where marginal cost is at a minimum.

F 10- Survivor technique advanced by George Stigler gives direction and exact magnitude of the cost curve.

III - Problem (15 points) . A firm's demand function is given as  $Q = 16 - P$  its total cost function is given as  $TC = 3 + Q + 0.25 Q^2$ .

a. for 5 points . Determine the firm's profit function

b. for 5 points. Determine the level of output that produces the profit maximum

c. for 5 points . Determine the level of profit at the optimum output

IV- 15 points for correctly answering parts a and b.

A manager estimated his firm's production function as:

$Q = 3L^{0.4} K^{0.6}$  (3 multiplied by L raised to the power 0.4 multiplied by K raised to the power 0.6).

The unit costs of inputs are  $K = 15$  and  $L = 5$

The firm's budget for input use is 6 million

a. For 10 points. Calculate the optimal levels of L and K

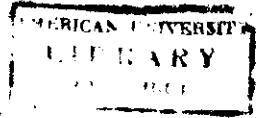
b. For 5 points. What would be the level of output corresponding to the optimal L and K.

V- (20 points).

a. Explain with the help of a clear diagrams how price and output equilibrium levels are determined in a pure competition market. (10 points).

b. Explain how you judge the usefulness of a model particularly if it is based on simple assumptions such as pure competition model. (5 points)

c. What determines the shut-down decision of a firm. Draw a diagram to illustrate your answer. (5 points).



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## EXAMINATION BOOKLET

90  
not collected

COURSE No.	
QUESTIONS No.	SCORE
1	
2	
3	
4	
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9	
10	
TOTAL SCORE OUT OF	

TO BE COMPLETED BEFORE STARTING THE EXAMINATION

SCHOOL Business DEPARTMENT MBA  
 DIVISION OR SECTION 1 COURSE Bus 305  
(NAME & NUMBER)  
 NAME OF STUDENT Radwan El-Ali  
 DATE April 9, 2003

### Instructions:

1. Complete the above blank spaces.
2. Start each question on a new page.
3. It is not permitted to ask questions during the examination.
4. Stop writing when you are told, otherwise you may lose total credit for the examination.

USE FOR ANSWER

Problem II:

- 1 - False; The value of a firm is equal to the sum of all the present values of all future profits that are generated.
- 2 - False; Firms in high levels of risk, operating in such industries, its shareholders anticipate a higher profit (than interest rate) to compensate them for taking such high risks.
- 3 - False; Marginal revenue is equal to zero when total revenues reach a maximum.
- 4 - False; if an increase in the price of one commodity leads to an increase in demand for a second commodity; it means they are substitute.
- 5 - False; The slope of the demand curve for commodity X is equal to  $\frac{\Delta Q_x}{\Delta P_x}$  while Price elasticity of demand is equal to  $\frac{\Delta Q_x}{\Delta P_x} \times \frac{P_x}{Q_x}$ .
- 6 - True; since error terms contains positive and negative values, they cancel each other. So, True.
- 7 - ~~True~~ False; the one yielding the smaller root - mean square error is better.

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Please, move to page 2.

8 - False, it would be ~~maximizing~~ <sup>optimizing</sup> the level of inputs ( $K$  and  $L$ ).

9 - True, from zero to point of inflection we have incremental decrease in MC, while from inflection point to ~~Maximum~~ V.C we have a increase in MC. At inflection point, we have minimum MC.

10 - False. Stigler's survivor technique divide the firms into small, medium and large, and see if they increase their market shares (efficiency) according to the category they belong to (in size).

Problem III:  $Q = 16 - P$   $TC = 3 + Q + 0.25 Q^2$

a)  $Q = 16 - P \Rightarrow P = 16 - Q$

total Revenue =  $P \cdot Q = (16 - Q) \cdot Q = 16Q - Q^2$

Profit =  $TR - TC$

$= 16Q - Q^2 - 3 - Q - 0.25 Q^2$

$\pi$  function =  $15Q - 1.25 Q^2 - 3$

b) 1<sup>st</sup> derivative of Profit function is equal:

$15 - 2.5 Q$

Set it equal to zero  $\Rightarrow 15 - 2.5 Q = 0$

$\Rightarrow Q = \frac{15}{2.5} = 6$

2<sup>nd</sup> derivative =  $-2.5 < 0 \Rightarrow$  This is the level of output where profit is maximum.

c)  $\pi = 15(6) - 1.25(6)^2 - 3$

$= 42$



Problem IV:

$$Q = 3L^{0.4} K^{0.6}$$

Cost of K = 15      Cost of L = 5.

Budget = C = 6,000,000.

a) Optimal levels  $\Rightarrow \frac{K^*}{L^*} = \frac{0.6}{0.4} \times \frac{P_L}{P_K}$

$$\frac{K^*}{L^*} = \frac{0.6}{0.4} \times \frac{P_L}{P_K}$$

$$= \frac{0.6}{0.4} \times \frac{5}{15} = 0.5 = \frac{1}{2}$$

$$\Rightarrow L^* = 2K^*$$

$$C = 6,000,000 = 15K^* + 5L^*$$

Substitute  $L^*$  in C

$$\Rightarrow 6,000,000 = 15K^* + 5(2K^*)$$

$$= 15K^* + 10K^* = 25K^*$$

$$\Rightarrow K^* = 240,000 \text{ unit of Capital}$$

$$L^* = 480,000 \text{ unit of Labor}$$

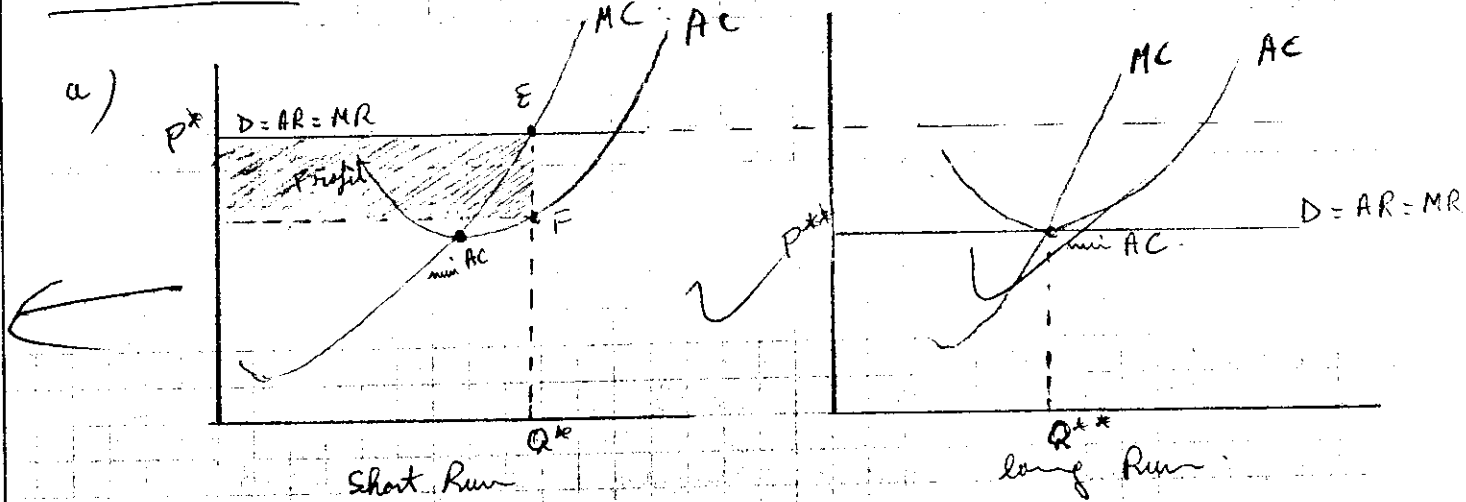
b)  $Q = 3 \times (480,000)^{0.4} \times (240,000)^{0.6}$

$$= 9,500,45.7$$

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When  $\rightarrow$  Market

Problem 2: Pure Competition Market.



- In the short Run; Price =  $P^*$ ; the Demand function is perfectly elastic, and  $D = AR = MR$ .  $AR = P$   
 the rising curve of MC is the supply function.  
 when MC & MR intersect at E, this is the equilibrium point where  $MC = MR$ ;  $\rightarrow$  Draw from E a vertical line which cuts AC curve at F and the horizontal axis at  $Q^*$ , the optimal output, respectively  
 and Profit =  $(AR - AC) \times Q^*$

- In the long Run; any suppliers enter the market so the price decrease to  ~~$P^*$~~   $P^{**}$ . Here we have the AC curve tangent to the demand curve at the point min AC and MC curve passes by AC curve at the same point, min AC.  
 So at the min AC point,  $MC = \text{min AC} = MR = AR$   
 and the profit is zero. From the point, min AC, if we draw a vertical line, it will cut the horizontal

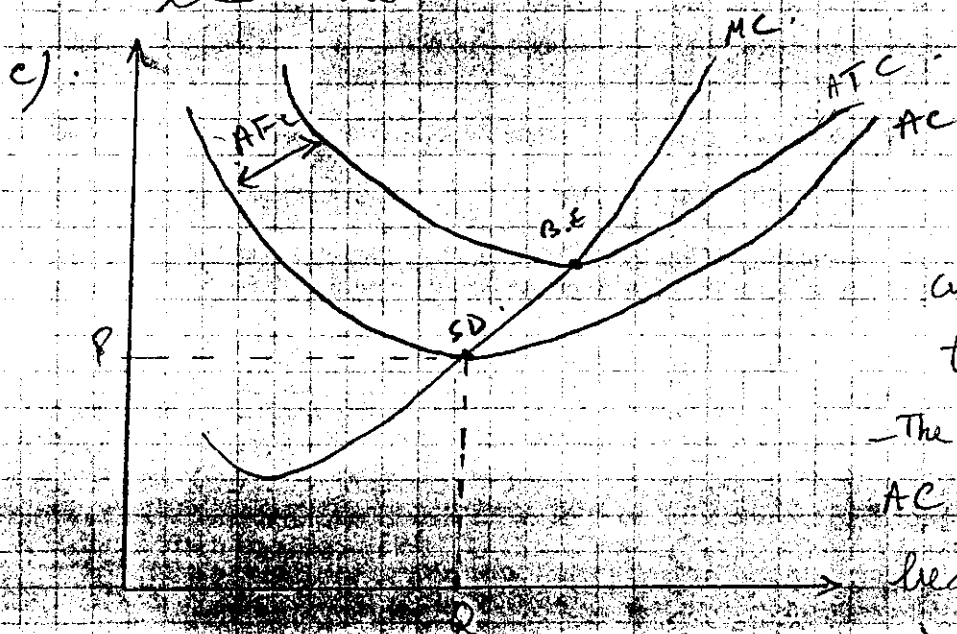
axis at  $Q^{*}$ .

b) - The assumptions made for pure competition are:

- No barriers of entry
- Many Suppliers/Producers.
- They produce homogeneous products
- They are price takers, not setters.
- They have perfect information.

This model is useful, since it explains the cause and effects, follows logical consistency, and is able to explain & predict the behaviour of the pure competition market.

Since there's no better theory for this model, so this model is useful based on the stuff mentioned.



MC Curve passes through both the AC curve minimum and the ATC minimum.

- The distance between ATC & AC decreases as output increases because AFC decreases since  $AFC = \frac{F_v C}{Q}$ .

- At BE point, the firm is able to cover both ~~AVC~~ AFC and ~~AVC~~ AVC. when the price goes further down to the S.D point; at the S.D point, the firm is ~~is~~ able to cover the variable cost but none of the fixed cost; If ~~if~~ the price goes further down, the firm won't be able to cover the fixed cost and ~~even~~ part of the variable cost. So at the S.D point, the firm is better off shutting down, then incurring losses by not being able to cover fixed costs as well as part of variable costs.

USE FOR ROUGH WORK ONLY

$Y \downarrow$  by 5%

$Q \uparrow$  by 3%

$\frac{3\%}{-5\%}$

$FC > FD$

$$Q = 24 - 2P$$

$$P = 6$$

$$Q = 10$$

$$\frac{P}{Q}$$

$$P = 6 \Rightarrow Q = 12$$

$$Q = 10$$

$$\frac{\frac{1}{Q} \Delta Q}{\frac{1}{Y} \Delta Y} = 0.2$$

$$\frac{\frac{1}{Q} \Delta Q}{\frac{\Delta Y}{Y}} = 0.2$$

$$Q = 1.6 P^{-1.5} Y^{0.2}$$

$$\epsilon = 0.2 = \frac{1}{\frac{1}{Q} \Delta Q}$$

$\uparrow P$  1.