

**Part I: Multiple Choice. Each is worth 2 points.**

- 1.
2. In a production process, all inputs are increased by 10%; but output increases less than 10%. This means that the firm experiences:
  - a) decreasing returns to scale.
  - b) constant returns to scale.
  - c) increasing returns to scale.
  - d) management incompetence.
3. If the law of diminishing returns applies to labor then:
  - a) the marginal product of labor must eventually become negative.
  - b) the average product of labor must eventually become negative.
  - c) the marginal product of labor must eventually rise as employment rises.
  - d) after some level of employment, the marginal product of labor must fall.
4. Which of the following costs always declines as output increases?
  - a) average costs
  - b) marginal costs
  - c) fixed cost
  - d) average fixed cost
  - e) average variable cost
5. A firm employs 100 workers, each at \$10 per hour, and 50 units of capital, each at \$21 per hour. The marginal product of labor is 3 and the marginal product of capital is 5. The firm:
  - a) is producing its current output level at the minimum cost.
  - b) could reduce the cost of producing its current output level by employing more capital and less labor.
  - c) could reduce the cost of producing its current output level by employing more labor and less capital.
  - d) could increase its output at no extra cost by employing more capital and less labor.
6. Assume that a firm's production process is subject to increasing returns to scale over a broad range of outputs. Long run average costs over this output range will tend to:
  - a) increase.
  - b) decrease.
  - c) remain constant.
  - d) fall to a minimum and then rise.
7. Every firm maximizes profit where:
  - a) average revenue equals average cost.
  - b) average revenue equals average variable cost
  - c) total costs are minimized.
  - d) marginal revenue equals marginal cost.
  - e) marginal revenue exceeds marginal cost by the greatest amount.
8. Higher input prices result in:
  - a) upward shifts of MC and reductions in output.
  - b) upward shifts of MC and increases in output.
  - c) downward shifts of MC and reductions of output.
  - d) downward shifts of MC and increases in output.

9. In a perfectly competitive industry, the market price of the product is \$60. Firm ZZTop is currently producing 5000 units. The firm's marginal cost is \$60, its fixed costs amount to \$40,000 and its average total cost equals \$65. If this firm is to maximize its profits in the short run, it should:
- a) maintain its current output.
  - b) reduce output.
  - c) expand output.
  - d) raise its price.
  - e) temporarily shut down
10. The imposition of an output tax on all firms in a competitive industry will result in:
- a) a downward shift in each firm's marginal cost curve
  - b) a downward shift in each firm's average cost curve.
  - c) a leftward shift in the market supply curve.
  - d) the entry of new firms into the industry.
  - e) higher profits for the industry as price rises.

**Part II: Answer ONE of the following questions for 8 points.**

11. You manage one department in a large corporation. Two years ago, you had 20 workers and produced 40,000 units. The company allocated 10 more workers to your department last year, and output increased to 45,000. You just received a memo from your boss indicating that she is very concerned about the 500-unit fall in the average productivity of your workers. How can you defend yourself?
12. A large real estate office wants to rent a new copying machine. One desktop model will cost \$200 per month to rent and \$0.035 per copy. Another larger model will cost \$400 per month for rental and \$0.02 per copy. Currently, the office makes about 15,000 copies per month. Which machine should they rent? What is the smallest number of copies per month that would make it desirable to rent the larger model?

**Part III: You must answer EACH question. Show all work.**

13. The short-run cost function of a company is given by the equation  $C = 190 + 53Q$ , where  $C$  is the total cost and  $Q$  is the total quantity of output, both measured in thousands.
- a) What is the company's fixed costs? [2 pts]
  - b) If the company produced 100,000 units of output, what is its average variable cost? [2 pts]
  - c) What is the marginal cost per unit produced? [2 pts]
  - d) Suppose the company borrows money and expands its factory. Its fixed costs rises by \$50,000, but its variable cost falls to \$45,000 per 1000 units. The cost of interest ( $I$ ) also enters into the equation. Each one-point increase in the interest rate raises costs by \$30,000. Write the new cost equation. [4 pts]

14. Consider a competitive market in which the market demand for the product is expressed as:

$$P = 75 - 1.5Q,$$

and the supply of the product is expressed as:

$$P = 25 + 10Q.$$

Price,  $P$ , is in dollars per unit sold, and  $Q$  represents the rate of production and sales in hundreds of units per day. The typical firm in this market has a marginal cost of:

$$MC = 2.5 + 10q.$$

- a) Determine the equilibrium market price and rate of sales. [3 pts]
- b) Determine the rate of sales for the typical firm, given your answer to part (a) above. [2 pts]
- c) If the market demand were to change to  $P = 100 - 1.5Q$ , what would the new price and rate of sales in the market be? What would the new rate of sales for the typical firm be? [5 pts]
- d) If the original supply and demand represented a long-run equilibrium condition in the market, would the new equilibrium (c) represent a new long-run equilibrium for the typical firm? Explain. [2 pts]

15. The Longheel Press produces memo pads in its local shop. The company can rent its equipment and hire workers at competitive rates. Equipment needed for this operation can be rented at \$52 per hour, and labor can be hired at \$12 per worker hour. The company has allocated \$150,000 for the initial run of memo pads. The production function using available technology can be expressed as:

$$Q = 0.25 K^{0.25} L^{0.75};$$

where  $Q$  is memo pads (boxes per hour),  $K$  is capital input (units per hour), and  $L$  is labor input (units of worker time per hour). The marginal products of labor and capital are as follows:

$$MP_L = (0.1875)K^{0.25} L^{-0.25}$$

$$MP_K = (0.0625)K^{-0.75} L^{0.75}$$

- a) Determine the appropriate input mix to get the greatest output for an outlay of \$150,000 for a production run of memo pads. (Hint: Remember to first solve for the optimal  $K/L$  ratio and then use the isocost equation.) [2 pts]
- b) Also, compute output. [1 pts]