INTERMEDIATE MICROECONOMICS

ECO 3101 Spring 2023

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Assignment 4

1.-Luca's inverse demand for public transportation is given by $P_L(q) = 10 - 2q$, where q represents the number of trips per week. Julia's inverse demand is given by $P_J(q) = 5 - q$. Obtain the aggregate demand for public transportation if these are the only two consumers of this good.

2.- A paper mill can produce paper of certain quality using labor, L, and two different types of pulp, Finish, *F*, and Canadian, *C*. The production function is $f(F, C, L) = F^{\frac{1}{3}}C^{\frac{1}{3}}L$.

a) Is this technology increasing, decreasing or constant returns to scale?

b) Suppose the firm is using 8 tons of each of the two types of pulp, *F* and *C*, and 10 hours of labor, but is considering reducing (by a very small amount) the use of pulp *F*. Per unit of pulp *F*, by how much does the firm need to increase the use of pulp *C* (keeping the same amount of labor *L*)?

3.- You own a firm that can dig holes using capital K and labor L. Using a bundle of inputs (L,K), you can dig $(L^{-1} + 9K^{-1})^{-1}$ holes. The price of capital is r = \$90, and the wage rate is w = \$10. How would you dig 10 holes, and how much would it cost you to dig each of them?

4.- The following table gives you all the combinations of inputs that allows one firm to produce 100 pounds of stuff. (Yes, the two inputs, A and B, are indivisible: cannot be used/purchased other that in whole units.)

A	20	17	14	12	10	9	8	7
B	1	2	3	4	5	6	7	8

a) Draw this isoquant.

b) If the firm is using 12 units of A and 4 units of B, what is (your best approximation to) the MRST?

c) If the price of A is \$10 and the price of B is \$18, what combination of inputs would the firm choose?

5.- Derive the (conditional factor demand functions and then the) cost function $C(q; w, r)$ for a firm with a production function$f(K, L) = L^{\frac{1}{4}}K^{\frac{1}{2}}$. Also, obtain the average cost function and the marginal cost function.

6.- The technology allows the production of some type of garment using labor (L), capital (K), and cotton (C). Using quantities (L,K,C) of inputs, it is possible to obtain $L^{\frac{1}{3}}K^{\frac{1}{3}}C^{\frac{1}{3}}$ units of garment. A firm has an installed capital $K = 64$. In the short run, changing L and/or M is possible, but changing K is not. The wage is \$1, the price of cotton is \$1, and the price of capital is \$8.

a) Compute the short-run cost function and variable cost function, and the fixed cost. Also, obtain the short-run average cost function, average variable cost function, and average fixed cost function. Finally, derive the short run marginal cost function.

b) In the short run, does this firm operate with increasing, constant, or decreasing returns to scale?

c) At what price of garments would the firm cease to operate in the short run?

d) Obtain now the long run cost function, knowing that in the long run all inputs can be adjusted (no fixed inputs). Find the level of output at which K=64 is in fact optimal. Observe how the short-run (total) costs when K=64 and the long-run (with optimal choice of K, of course) costs relate for different levels of output