2. The output (Q) of a firm is related to the inputs, labour (L) and capital (K), by the function

$Q = f(K,L) = 10L^{1/2}K^{1/2}$.

Its isocost function is:

$C = wL + rK$.

(a) Using the production function , express the amount of labour employed by the firm as a function of the level of output it produces and the amount of capital it employs.

(b) Using your results from part (a), along with the isocost function, determine firm's short-run costs function, assuming the price of capital, r, is \$40, the price of labour, w, is \$10, and the level of capital is held constant at 8 units.

(c) Using your results from part (b), along with the fact that the firm's long-run cost function is:

LRTC = 4Q,

determine the level of output, Q, at which the firm's short run total cost is equal to its long-run total cost. Also determine the optimal amount of labout that must be combined with the 8 units of capital to produce this level of output.

(d) Using your results from part (c), determine the values of short- and long-run costs.

(8 marks)

3. Consider two firms selling passenger jet aircrafts. They are located in different countries, and sell into the world market. The two firms are A and B. The world demand for jets is given by

$p = 20 – q$.

Both firms produce with the same linear total cost function given by

$c_1(q_1) = 8q_1$ and

$c_2(q_2) = 8q_2$.

(a) First consider the market where there is only one producer (either A or B). Find the monopoly output, price, and profits for the monopolist.

(b) Now assume both firms are producing. Find the Cournot/Nash equilibrium for these two firms. Remember that $q = q_1 + q_2$, and each firm will maximise its own profits assuming the other one stays with its current output level. Record the amount produced by each firm, the price, and the profits for the two firms.

(c) How has price and output changed from the monopoly situation. Would these firms prefer to perfectly collude and behave as a monopolist, splitting the monopoly profits?

(d) Now the government in the country where A resides decides to subsidise the production of jets. They put on a per unit subsidy of 3 which reduces the effective marginal cost to 8 – 3 = 5.

There is no change in the country which B resides. Find the new Cournot/Nash equilibrium, and report the price, and profits. Has the price fallen or increased?

(e) Report the profit net of subsidy amount. Has this increased relative to the case without subsidy? If the government lump sum taxes the subsidy cost from the firm, and cares only about the firm's profits, and the well being of the airline industry purchasing these jets, will all 3 of these parties prefer the case with subsidy.

(8 marks)