Strategic Behavior:

Question 1.
Suppose two firms, 1 and 2, face demands \( x_1 = a_1 - b_1 p_1 + d p_2 \) and \( x_2 = a_2 - b_2 p_2 + d p_1 \) where \( a_1 > 0, a_2 > 0, b_1 > 0, b_2 > 0, d > 0 \). Consider that both firm’s marginal costs are constant and equal to \( c \). Consider firm 1 is an incumbent and firm 2 is a potential entrant. Firm 2 has fixed costs \( F \) and firm 1 has sunk costs \( F \). Suppose that if firm 2 enters they compete as Nash-Bertrand.

(i) Are the products substitutes?

(ii) What is the Nash equilibrium in prices?

(iii) What is the limit price that firm 1 can charge to deter entry?

(iv) How does the limit price depend on \( d \)? What is the intuition?
**Question 2.**

Suppose two firms are Cournot competitors. Inverse demand is $P = 10 - Q$. Firm 1’s costs are $C_1(q_1) = (5 - k_1)q_1 + k_1^2$, and firm 2’s costs are $C_2(q_2) = 5q_2$, where $q_1$ and $q_2$ are firm 1 and firm 2’s outputs, respectively, and $k_1$ is a sunk investment that firm 1 can make to lower its marginal cost. In a first period, firm 1 chooses $k_1$. In the second period, firm 2 observes $k_1$ and makes its entry decision. If it enters, then firms simultaneously compete.

What is firm 1’s strategy if it wants to deter entry?
**Vertical Relationships**

**Question 3.**

Multiple dealerships with exclusive territories is the focus of this exercise. Suppose there is a single manufacturer of a certain good that has marginal cost of production $c$ and sells the good to $N$ dealers at the same wholesale price $w$. These $N$ dealers then distribute the product and sell it to final consumers at price $p$ and provide services, $s$, that increase the sales of the product. Each of these distributors is an exclusive dealer over a certain territory and faces a local demand $q = (a-bp) s^d$, where $a$, $b$ and $d$ are demand parameters that are identical to all retailers and $0<d<1$.

Suppose retailers choose $p$ and $s$ to maximize their profits. Each unit of services provided costs them $1$. The dealers have no additional costs other than the service costs and the wholesale price they have to pay to the manufacturer.

(i) What level of $s$ and $p$ does each retailer choose given $w$?

(ii) What $w$ does the manufacturer chose for $d=1/2$?

(iii) For general $d$, please show how the optimal $w$ changes with increases in $d$? (Hint. From the manufacturing profit maximizing FOC you get optimal $w$ as a function of $d$…)}
Question 4.

(i) Franchises, such as McDonalds, have outlets spread over a wide geographical area. The franchise owns typically some of the outlets, where the manager is just a salaried employee. The remainder outlets are owned by the franchisees. They pay the franchiser a fixed proportion of revenues and also a fixed fee regardless of revenues, in return for the privilege of using the franchise’s name. Explain the variation in ownership structure.

(ii) A contract with a new franchisee specifies that the latter has to buy a huge neon sign with the logo of the franchise. The neon sign is very expensive. Explain what happens to the optimal franchise fee? Explain why such a requirement (neon sign as a clause in contract) may be optimal for the franchiser?