MASTER OF ARTS EXAMINATION, 2025

2nd Year, 2nd Semester

DEPARTMENT OF ECONOMICS

Subject Code : ARTS/ECO/DSE/10.19

INDUSTRIAL ECONOMICS

Time : Two Hours **Full Marks : 30**

Answer any two of the following $15 \times 2 = 30$

Question 1: Consider a market with two horizontally differentiated products and inverse demands given by $P_i(q_i, q_j) = a - bq_i - dq_j$. Set $b = 2/3$ and $d = 1/3$. The system of demands is then given by $Q_i(p_i, p_j) = a - 2p_i + p_j$. Suppose that firm 1 has cost $c_1 = 0$ and firm 2 has cost $c_2 = c$ (with $7c < 5a$). The two firms compete in prices. Compute the firms' profits:

(a) At the Nash equilibrium of the simultaneous Bertrand game;
(b) At the subgame-perfect equilibrium of the sequential game
  (i) With firm 1 being the leader, and
  (ii) With firm 2 being the leader.
(c) Show that firm 2 always has a second-mover advantage, whereas firm 1 has first-mover advantage if c is large enough. Intuitively explain your result.

Question 2: Consider the vertical differentiation model. Suppose that the quality of the product can be described by some number $s_i \in [\underline{s}, \bar{s}] \subset \Re_+$. Consumers are identified by $\theta \in [\underline{\theta}, \bar{\theta}] \subset \Re_+$, which measures their preference for the quality. Consumers are distributed uniformly on $[\underline{\theta}, \bar{\theta}]$ and are of mass $M = \bar{\theta} - \underline{\theta}$. A consumer of type θ receives a utility of

$$v_i(p, y; \theta) = r - p_i + \theta s_i$$

When consuming a unit of good i (where r is supposed to be sufficiently large, so that all consumers buy in the market).

Two firms compete in the market. We look for the subgame-perfect equilibria of the following two-stage game: firms first choose the quality of their product and then compete in prices. Further, the marginal cost of production depends on quality. We denote by $C(q_i, s_i)$ the cost of firm i producing q_i units at a quality s_i and we assume

$$C(q_i, s_i) = aq_i s_i.$$

With $a > 0$, this formulation introduces a trade-off between quality and quantity as the marginal cost of production is as_i, increases with quality. That is, if the firm increases one dimension (quality or quantity), the cost providing the other dimension increases and the amount of this other dimension is thus reduced.

(a) Show that condition $\bar{\theta} > max\left\{2\underline{\theta} - a, \frac{\underline{\theta}+a}{2}\right\}$ guarantee interior solution of the pricing game.

(b) Consider the second stage of the game where firms set prices simultaneously, taking the qualities as given. Firm 1 produces quality s_1 and firm 2 produces quality s_2, with the convention that $s_1 < s_2$. Derive the Nash equilibrium in the prices and express the equilibrium quantities and profits of the two firms at stage 2.

(c) Find the stage 1 quality choice and discuss the effect of quality and quantity trade off on the quality choice.

Question 3: Suppose that a monopolist produces two product 1 and product 2. There is a mass 1 of consumers. A share λ of consumers are heterogeneous among each other and are described by their type θ. This type is distributed uniformly on the unit interval. The willingness to pay for product 1 is assumed to be $r_1 = \theta$ and $r_2 = 1 - \theta$. A share $(1 - \lambda)/2$ of consumers has willingness to pay for product 1 is assumed to be $r_1 = 2/3$ and $r_2 = 0$. The remaining share $(1 - \lambda)/2$ of consumers has willingness to pay for product 1 is assumed to be $r_1 = 0$ and $r_2 = 2/3$. Calculate the solution of independent selling, pure bundling and mixed bundling.

(a) At $\lambda = 1$ which one is profit maximizing.

(b) Repeat for $\lambda = \frac{4}{5}$ and $\lambda = \frac{2}{3}$.

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