Enrolment No. _____

# AHMEDABAD UNIVERSITY

## AMRUT MODY SCHOOL OF MANAGEMENT

## GRADUATE PROGRAMMES

2023-2024 WINTER SEMESTER

END SEMESTER EXAMINATION

## ECO504 INDUSTRIAL ORGANIZATION

Date: 21-04-2024 Total Marks: 50

Time: 11.00 am – 1.30 pm No. of printed pages: 03

**NOTE: The question paper has three sections. Read the entire question paper before attempting any question. You have two and a half hours to attempt the exam.**

**Section A: Answer all questions in this section. Each question carries 5 marks.**

1. Derive the price-cost mark-up equation for a monopolist for a general inverse demand curve; i.e. $P = D(Q)$, where $D(Q)$ is downward sloping and total costs are $TC = c.Q$. What happens to price if elasticity is less than 1? How should inelastic goods be priced?

2. Imagine that the Government imposes tariff on a low quality intermediate good used in textile product manufacturing. As a result, the share of the big firms in the textile industry increases, while those of the smaller firms falls.
    a. Given this description, would you model the textile industry as a homogeneous goods industry or a differentiated products industry?
    b. Given your choice in the previous question, would the difference between the prices of the textile products sold by bigger firms and the smaller firms increase or decrease in the short run, assuming that **in the short-run elasticities do not change**?
    c. Imagine that in the long run, smaller firms switch to importing higher quality and more expensive raw material (same as big firms). This could have two effects on consumer demand—demand for textile products may decrease due to increase in prices, or demand may increase due to improved quality. How will you determine which effect is dominant? What all data would you require?

3. To remove misallocation in the economy, less productive factories need to shut down so the resources can be utilized in more productive factories. Conversely, misallocation may occur when less productive firms survive longer. Which of the following will allow reallocation in the economy?
    a. Removing licensing requirement for entrants
    b. Retrospective taxation imposed on the most profitable firms
    c. Retrospective taxation imposed uniformly
    d. Import restrictions

**Section B: Attempt any one question. Each question carries 20 marks.**

1. Consider a market which has a monopolist wholesaler and two retailers. Retailers are Cournot competitors. The wholesaler sells the product at per unit price of W and incurs a cost of Rs. 5 per unit in production. The retailers' only cost is the procurement costs; i.e. each incurs a total cost of

W.$Q_i$, where $i \in \{1,2\}$ denotes the retail firm. The inverse demand function in the retail market is $P = 100 - Q_1 - Q_2$.

a. Find the profit maximizing $Q_1$ and $Q_2$ as a function of W. Given $Q_1$ and $Q_2$, can you find the inverse demand function faced by the wholesaler. Note that the procurement costs for retailers is equal to the price received by the wholesaler. (*Hint: Demand faced by wholesalers is the total supply by the retailers.*) [5 marks]

b. Use the inverse demand function in the wholesale market to find the profit maximizing W. [5 marks]

c. Using your answer in c, find the profit maximizing $Q_1$ and $Q_2$. [2 marks]

d. Concerned by the low output in the retail market, the government decides to intervene in the market. It has one of two choices—either make the wholesaler a public firm and sell its products to both firms at zero profits, or make one of the retailers a public firm and sell its product at zero profits. Compute aggregate output in the market under each intervention. Under which situation, would the aggregate output be higher in the retail market? [8 marks]

2. The Inverse Demand Function is $P = 100 - Q$. There are three firms each of which has market power. $Q = q_1 + q_2 + q_3$. Let the technology used by each firm be TC $= q_i$.

a. Compute the profits of each firm in this market if the firms play a Cournot game. [8 marks]

b. Now assume that Firm 1 chooses $q_1$ in period 1. Firm 2 chooses $q_2$in period 2. Firm 3 chooses $q_3$ in period 3. Final price is determined after the chosen production level. What is the percentage increase in profits of the industry leader (Firm-1)? [8 marks]

c. Given your answer in b., how much money will a firm be willing to pay to be the industry leader? [4 marks]

3. Consider the following production function for a firm $y = A_i\sqrt{k}$, where a firm uses only capital for production. The costs to the firm are $TC = r.k$.

a. Compute the profit maximizing $k$ and profit for a firm with productivity $A_i$. Denote the optimal capita and profits by $k^*$ and $\pi^*$, respectively. [6 marks]

b. Government wants resources, $k$, from less productive firms to move to high productivity firms. To do so, government introduces a new reform whereby a firm can trade its resources with other firms if it decides to shut down. For eg; government reforms the land market whereby selling land becomes easier. Now, a firm can continue operating and earn profits, $\pi^*$, OR it can decide to shut down and sell its resources, $k^*$, at a scrap value of $v_S = \sqrt{k^*}$. Can you find the maximum value of $A_i$ such that all firms below this productivity level would want to shut down and sell its capital for scrap value? Denote this level by $\underline{A}$. [4 marks]

c. Assume that $A_i$ takes one of these five values— {0.5, 1.5, 2.5, 3.5, 4.5}. From your answer in b, which factories will decide to exit? How much capital will they release back into the market? [4 marks]

d. Imagine that the scrap value function was linear in $k^*$; i.e. $v_S = \delta.k^*$. Verify that with this functional form of the scrap value function, no firm would want to sell its resource if $\delta < r$. In such a case, this market does not work. How will you change the profit function such that some firms exit while others stay? *(Hint: think about an additive parameter)* [6 marks]

**Section C: Attempt any one question. Each question carries 15 marks.**

1. Let the production function of a factory be $Y_i = A_i K_i^{\alpha} L_i^{\beta}$ and the costs are given by $w.L_i + R.K_i$.

a. Government imposes a 5% tax on wages. Assume that in the short run factory only adjusts labour. What will be the proportionate decline in output in the short run? Assume that in the

long run, factory changes capital as well. What will be the proportionate decline in output in the long run? [7.5 marks]

b. Assume that factories take two years to adjust capital. You have the following data from output of a factory:

| Year | 1 | 2 | 3 |
|---|---|---|---|
| Output | 100 | 93.84 | 88 |

You know that the government imposed a tax rate of 10% on this factory in year 2, upon which the factory adjusted its labour quickly. In year 3, factory adjusted its capital as well. Using this data and your answer in a, can you find the estimates of $\alpha$ and $\beta$. *(You are allowed to use scientific calculator for this question)*[7.5 marks]

2. *Oshwal* restaurant on Ashram Road offers world-famous-in-Ahmedabad *pav bhaji*. Dining at *Oshwal* provides consumer with utility $U_H = k_i\sqrt{Q_H} - P_H.Q_H$, where $P_H$ is the price at *Oshwal*. If the consumer cooks *pav bhaji* at home she obtains utility $U_L = \sqrt{Q_L} - P_L.Q_L$, which is the same across all consumers, and has to pay a price $P_L$.

   a. Above what level of $k_i$ will the consumer prefer eating at *Oshwal* restaurant over cooking at home? [2 marks]

   b. $k_i$ varies for different consumers but its the value can be one of the five numbers {1,2,3,4,5}. Let following be the distribution of $k_i$; i.e. the number of people for each value $k_i$.

| $k_i$ | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| $N_i$ | 100 | 100 | 100 | 100 | 100 |

Assume that $P_L = 50$ and $P_H = 200$. How many consumers would come to *Oshwal?* Of those who come to *Oshwal*, how much quantity would they consume? [4 marks]

   c. Total demand for the *Oshwal* restaurant arises from two margins:
      i. Extensive Margin: Number of people who choose *Oshwal* Restaurant, and
      ii. Intensive Margin: Of the people who choose *Oshwal* Restaurant, the amount they consume.

Find the demand for *Oshwal's pav bhaji* at the following prices (assume that $P_L = 50$) [6 marks]

| $P_H$ | Intensive Margin (no. of consumers) | Extensive Margin (quantity consumed) | Total Demand |
|---|---|---|---|
| 500 | | | |
| 750 | | | |
| 1000 | | | |
| 1250 | | | |

   d. If the cost of making *pav bhaji* is Rs. 125, then what is the profit maximizing quantity for *Oshwal*. [3 marks]