BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
FIRST SEMESTER 2022-2023
Comprehensive Examination (Closed Book)

Course No.	: **ECON F242**	Max. Marks	**: 40**
Course Title	: **Microeconomics**	Weightage	**: 40%**
Date	: **23/12/2022(FN)**	Duration	**: 3 hours**

Q1. The industry X is perfectly competitive industry, and each producer has a long-run average cost function which is given by $AC(Q) = 20 + Q + \frac{144}{Q}$. The market demand curve is $D(P) = 2488 - 2P$. **[2M]**

a) What is the long-run equilibrium price in this industry, and at this price, how much would an individual firm produce?
b) How many active producers are in the industry in a long-run competitive?

Q2. In a perfectly competitive market, the market demand curve is given by $Q^d = 200 - 5P^d$, and the market supply curve is given by $Q^d = 35P^s$. **[4M]**

a) Find the perfectly competitive equilibrium market price, quantity demanded/ supplied.
b) Find the consumer surplus and producer surplus. What is the net economic benefit at the above mentioned equilibrium point?
c) Suppose a production quota of 70 is imposed, what is the quantity supplied after the implementation with this policy?
d) Find the consumer surplus and producer surplus under the policy mentioned in (c). What is the net economic benefit in this case?
e) Does this policy result in a deadweight loss? If so, how much is it?

Q3. Consider the markets for butter (B) and margarine (M), where the demand curves are: $Q = 20 - 2P_M + P_B$ and $Q = 60 - 6P_B + 4P_M$ and the supply curves are $Q_M = 2P_M$ and $Q_B = 3P_B$. **[4M]**

a) Find the equilibrium prices and quantities for butter and margarine.
b) Suppose that an increase in the price of vegetable oil shifts the supply curve of margarine to $Q_M = P_M$. How does this change affect the equilibrium prices and quantities for butter and margarine? Using graphs, explain why a shift in the supply curve for margarine would change the price of butter.
c) Do the demand schedules indicate that butter and margarine are substitute goods, complementary goods, or independent goods in consumption? How do you know? Substantiate your answer.

Q4. (I) Assume that a monopolist sells a product with a total cost function $TC = 1{,}200 + 0.5Q^2$. The market demand curve is given by the equation $P = 300 - Q$. **[4M]**

a) Find the profit-maximizing output and price for this monopolist. Is the monopolist profitable?
b) Calculate the price elasticity of demand at the monopolist's profit-maximizing price. Also calculate the marginal cost at the monopolist's profit-maximizing output. Verify that the IEPR holds.

(II) Suppose a profit-maximizing monopolist producing Q units of output faces the demand curve $P = 20 - Q$. Its total cost when producing Q units of output is $TC = 24 + Q2$. **[4M]**

a) If the producer charges a uniform price, how large will the profit be?
b) As an alternative, suppose the firm can engage in perfect first-degree price discrimination, how large will the profit be?
c) How much extra profit does the producer capture when it can engage in first-degree price discrimination instead of charging a uniform price?

Q5. Let each firm in an industry have $TC = 4,00,000 + 4{,}640Q + 10Q^2$. Let market demand be $P = 20{,}000 - 15.6Q$ for each firm. **[6M]**

a) Calculate the short run economic profits / loss earned by a monopolistically competitive firm.
b) Calculate the long run equilibrium price, output and economic profit /loss for this firm.
c) Calculate the long run equilibrium price, output and economic profit /loss for this firm if it has operated as a perfectly competitive firm.
d) Calculate the excess capacity.

P.T.O.

Q6. A homogeneous products duopoly faces a market demand function given by $P = 300 - 3Q$, where $Q = Q1 + Q2$. Both firms have a constant marginal cost $MC = 100$. Now answer the following questions: (Note: Keep the values till 3 decimal points) **[6M]**

- **a)** What is Firm 1's profit-maximizing quantity, given that Firm 2 produces an output of 50 units per year?
- **b)** Derive the equation of each firm's reaction curve and then graph these curves.
- **c)** What is the Cournot equilibrium quantity per firm and price in this market?
- **d)** What would the equilibrium price in this market be if the two firms colluded to set the monopoly price?
- **e)** What is the Bertrand equilibrium price in this market?
- **f)** What are the Cournot equilibrium quantities and industry price when one firm has a marginal cost of 100 but the other firm has a marginal cost of 90?

Q7. Suppose the market for LED bulbs has one dominant firm and five fringe firms. The market demand is $Q = 400 - 2P$. The dominant firm has a constant marginal cost of 20. **[4M]**

The total supply curve for the five fringe firms is $\boldsymbol{Q_f = P - 20}$

a) Find the profit-maximizing quantity produced and price charged by the dominant firm, and the quantity produced and price charged by each of the fringe firms.

b) Suppose there are ten fringe firms instead of five. How does this change your results?

Q8. (I) Two competing firms are each planning to introduce a new product. Each will decide whether to produce Product A or Product B. The following table shows the profits associated with each pair of choices: **[2M]**

		Firm 2	
		A	*B*
Firm 1	*A*	(25, 9)	(33, 10)
	B	(30, 13)	(36, 12)

- **a)** If both firms decide their strategies simultaneously, what is the Nash equilibrium?
- **b)** If Firm 1 could move first and credibly commit to its capacity expansion strategy, what is its optimal strategy? What will Firm 2 do?

(II) Two firms compete by choosing price. Their demand functions are **[4M]**

$$Q_1 = 20 - P_1 + P_2 \quad \text{and} \quad Q_2 = 20 + P_1 - P_2$$

where P_1 and P_2 are the prices charged by each firm, respectively, and Q_1 and Q_2 are the resulting demands. Marginal costs are zero.

- **a)** Suppose the two firms set their prices at the *same time*. Find the resulting Nash equilibrium. What price will each firm charge, how much will it sell, and how much will be the resulting amount of profit ?
- **b)** Suppose Firm 1 sets its price *first* and then Firm 2 sets its price. What price will each firm charge and what will be their profit level?
- **c)** Represent the above situation with the help of a well labeled payoff matrix.

*******END*******