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COURSE: B A (H) ECONOMICS, SEMESTER – 4

PAPER: INTERMEDIATE MICROECONOMICS – II

GAME THEORY

- **Nash Equilibrium:**

It is outcome of the game from where no agent or player has an incentive to deviate.

- Nash equilibrium may not necessarily be pareto superior. e.g.

Prisoner's Dilemma

		PRISONER 2	
		Confess	Lie
PRISONER 1	Confess	-8, -8	0, -10
	Lie	-10, 0	-1, -1

Example 1:

Battle of sexes – This game has multiple (two) nash equilibria.

		WOMAN	
		Boxing	Shopping
MAN	Boxing	<u>2, 1</u>	0, 0
	Shopping	0, 0	<u>1, 2</u>

Notes: It is possible that a game may have no nash equilibrium under pure strategy.

Example 2:

	Attack East City	Attack West City
Defend East City	(0, 1)	(1, 0)
Defend West City	(1, 0)	(0, 1)

This game has no nash equilibrium under pure strategy.

However, we may find nash equilibrium under mixed strategy. (To be discussed in later lectures).

Overall, it can be observed that it is not necessary that we will always obtain a nash equilibrium under pure strategy but we will always obtain nash equilibrium under mixed strategy regardless of the existence of nash equilibrium under pure strategy.

Practice Questions:

Find Nash Equilibrium under pure strategy. Also, check if either or both players have dominant strategy.

Q.1

2, 2	3, 5
1, -1	0, 4

Q.2

0, 10	13, 9
-5, 0	7, 6

Q.3

$22, 52$	$-3, 50$
$0, 0$	$-55, 8$

Q.4

$-2, 20$	$33, -15$
$10, -11$	$8, 8$

Q.5

20, 20	5, 5
1, 2	0, -4

Q.6

-2, -2	0, 0
1, -1	-5, 5

Q.7

$2, 2$	$2, 2$
$2, 2$	$2, 2$

Q.8

$20, 2$	$3, 0$
$1, -1$	$0, -4$

Q.9

100, 50	100, 20
100, 50	100, 20

Q.10

100, 50	100, 20
50, 40	50, 10

Answers of these questions will be discussed in class. Note: Remaining advanced topics of Game Theory will be covered later.

UNIT- 3, IMPERFECT COMPETITION

Notes for Monopoly section.

Unit - 3 (chapter-14) Monopoly Snyder and nicolsen

Monopoly :

- 1) Single supplier to the market
- 2) Can choose to produce any point on the demand curve
- 3) Can choose either p or q but not both (usually q (output))

assumption :

In this chapter, we assume monopoly choose quantity of Q/P that maximises profit.

Barriers to entry :

these are source of all monopoly power two types of barrier are:

- (1) Technical Barriers
- (2) legal Barriers

in natural monopoly case (AC keeps on declining)
it is following, given market size or market demand

* average cost is decrease and the above of marginal cost curve.

Technical Barriers

- 1) decreasing marginal or Average cost over a wide range of output levels
- 2) If technology of production is such that relatively large scale firms are low cost producers, we refer this as natural monopoly, hence, other firms may find difficult to produce in this market, because new firm would be producing relatively low output at a relatively higher cost.

note)

- declining cost on absolute scale is not necessary, declining cost need only to large relative to market.
- 1) special knowledge of low cost productive technique, technology secret incentives are (way of) technical barriers. But for technology to be kept on secret we must be protected by a patent.
 - 2) Ownership of unique resources, example, mineral deposits, land locations etc.

Legal Barriers

- 1) Pure monopolies can be created by law rather than economic conditions. example, legal protection of a product by a patent, and copy rights. (Drugs, computer chips, Animated movie etc)

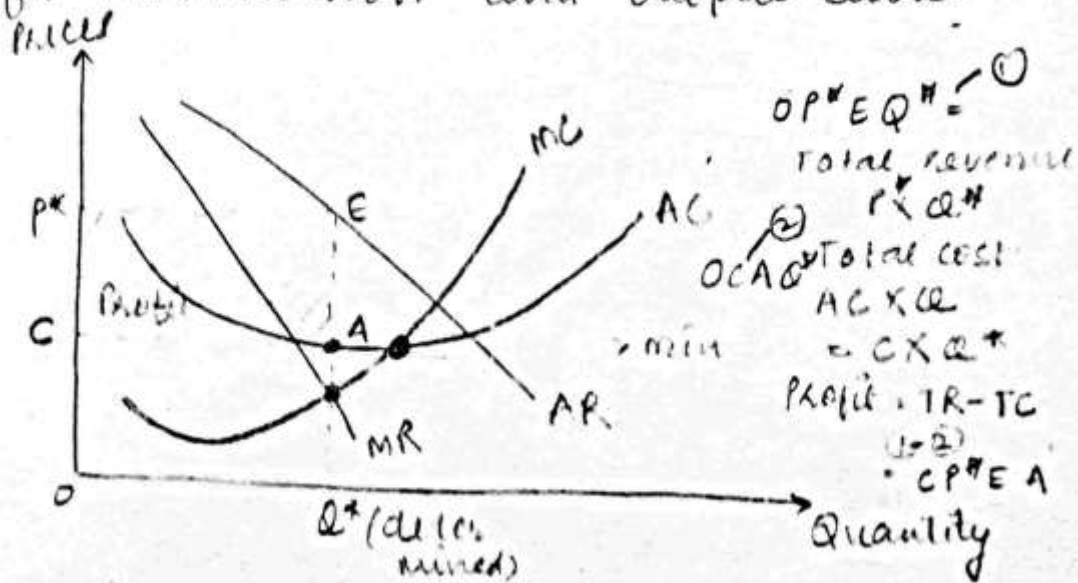
Govt granting monopoly makes innovation more profitable and generates incentives.
 Restrictions of entry along with price cap for a franchise (monopolist) makes market more monopolised (Govt can create monopoly by awarding an exclusive franchise to serve market). Example, public utility like gas, electricity, water, communication services, Post office, TV, radio station etc.

Creation of Barriers to entry

Firm may develop unique product or technology by taking extraordinary steps and protect products and technologies, copied and imitated by other firm, and protect them from imitated.

But this entails a cost firms may also buy unique resources to prevent potential entry

Profit maximisation and output choice



Inverse elasticity rule

$$MR = AR \left(1 - \frac{1}{e} \right)$$

$$e = \frac{dQ}{dP} \left(\frac{P}{Q} \right)$$

(3) -ve signs

$$e = 2$$

Book

$$MR = AR \left(1 + \frac{1}{e} \right)$$

(using)

$$e = \frac{dQ}{dP} \left(\frac{P}{Q} \right)$$

(1) -ve sign

$$e = \underline{\underline{-2}}$$

negative

$$MR = AR \left(1 + \frac{1}{e} \right)$$

at profit maximising pt
 $MR = MC$ and $AR = P$

$$MC = P \left(1 + \frac{1}{e} \right)$$

$$MC = P + \frac{P}{e}$$

$$-\frac{P}{e} = P - MC$$

$$\boxed{-\frac{1}{e} = \frac{P - MC}{P}}$$

$$\left\{ \left(\frac{-1}{e_{Q,P}} \right) = \frac{P - MC}{P} \right\}$$

Interpretation for this formula

- 1) Monopoly will choose to operate in that region of demand curve where $e < -1$.
(elastic segment)

is more elasticly greater than -1 demand curve is inelastic

note)

till now,

$\rightarrow e > 1 \rightarrow$ elastic

$\rightarrow -\frac{dq}{dp} \times \frac{p}{q} > 1$

multiply both side by -1

$\Rightarrow \frac{dq}{dp} \times \frac{p}{q} < -1$

$$\boxed{e^{new} < -1}$$

$$\boxed{e < 1}$$

$$\left(-\frac{dq}{dp} \times \frac{p}{q} \right) < 1$$

$$\boxed{\frac{dq}{dp} \times \frac{p}{q} > -1}$$

$$e^{new} > -1$$

3) $(P - MC)$ is equal to markup

- In Perfect Comp. it is zero through profit maximising output line ($P = MC$)

1) if $e = -2$ then $P = 2MC$

$$MC = P \left(1 + \frac{1}{-2} \right)$$

$$MC = P \left(\frac{1}{2} \right)$$

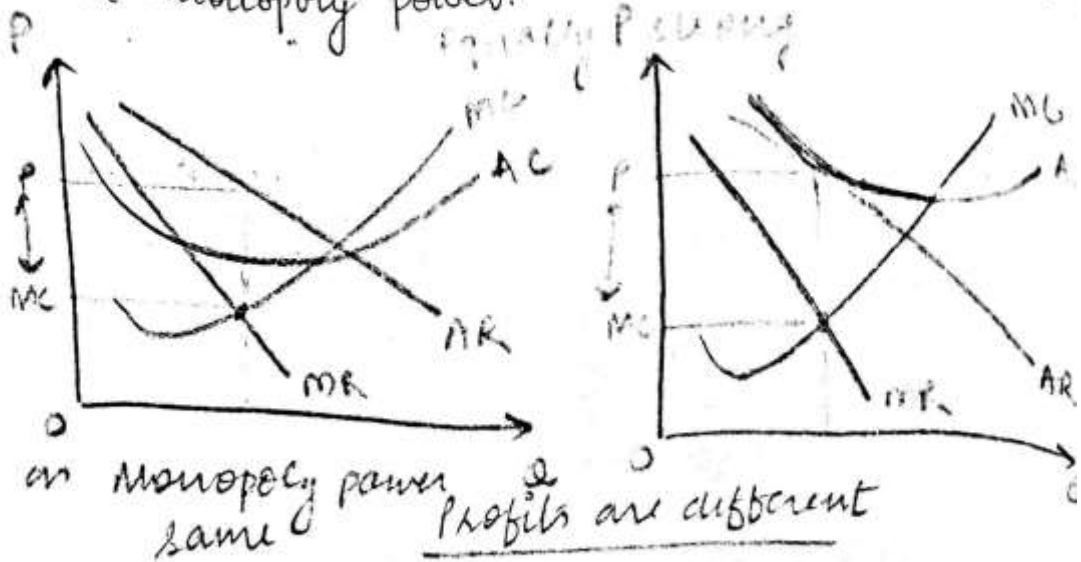
$$\boxed{2MC = P}$$

Monopoly profits

divergence b/w P & MC determines size of profit

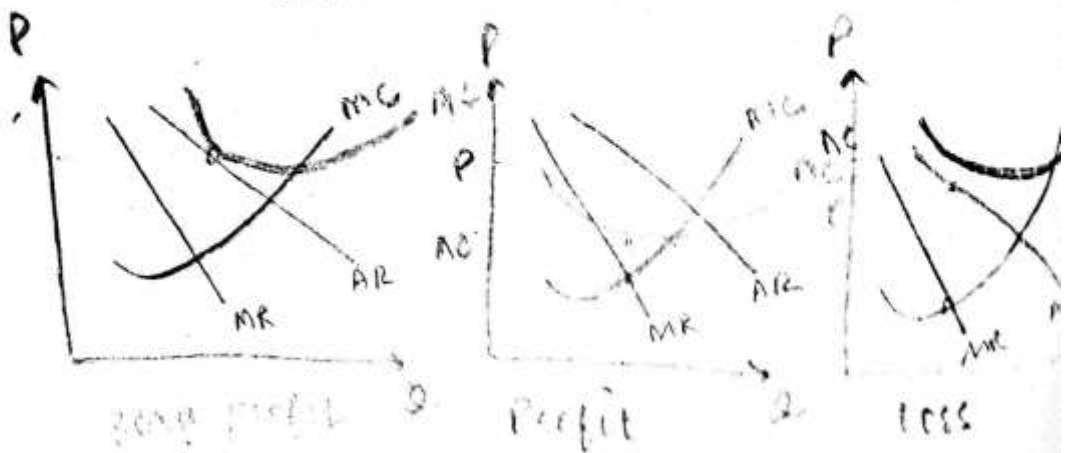
No entry is possible in monopoly market bc monopoly positive profits can exist even in long run. Profits that monopoly earns in long run are also referred as monopoly rent.

- Relation b/w size of profit and monopoly power.
 There is no relationship b/w size of profit and monopoly power.



- AR, MR, MC are same in diagram (1) and (2)
- 1) Size of profit is measured by divergence b/w P and AC ($TR > TC$ / $AR > AC$ OR $P > AC$)
 - 2) monopoly power is measured by divergence b/w P and MC

In short in monopoly firm having a loss also



$P = MC$ - efficient point
 $P = AC$ - Break even point
 $P = AVC$ - Shut down

Here both monopolies are equally strong
 because they have similar divergence b/w
 P and MC . But first monopolist high profits
 and second earns zero profit,
 Hence size of profits is not a major of
 strength of monopolist.

No Monopoly Supply Curve : ^{Supply Curve} (MC cost above $AVC - FC$ mark)

for monopolist given a fixed demand curve,
 supply curve is just a point. that is
 price and quantity combination for which
 $MR = MC$.

Hence joining these points for different demand
 curves does not make any significance
 meaning. Hence locus of such points
 may have a very strange shape depending
 upon how market demand curve elasticity
 changes as demand curve shifts.

Hence well defined supply curve exist and
 for each demand curve has a pair unique
 profit maximising opportunity (P, Q combination)