Q.NO: What is dynamics of market price.

The Framework.

Suppose that for a particular commodity the supply and demand functions are

$$Q_d = \alpha - \beta p \qquad (\alpha, \beta > 0)$$

$$Q_s = -\gamma + \delta p \qquad (\gamma, \delta > 0)$$

The equilibrium price should be

$$\bar{p} = \frac{\alpha + \gamma}{\beta + \delta} \qquad \text{(some positive constant)}$$

If $P(0)=\bar{P}$, the market will clearly be in equilibrium and no dynamic analysic will be needed. If $\bar{P} \neq P(0)$ however $\bar{P}$ is attainable after due process of adjustment. The price and quantity variables can be taken as a function of time.

The time path:

Let us assume that the rate of price change (with respect of time) at any moment is directly proportional to the excess demand $(Q_d - Q_s)$ prevailing at the moment. Symbolically as.

$$dP/dt = j(Q_d - Q_s) \qquad (j > 0)$$

where j = adjustment co-efficient

$$dP/dt = 0 \quad \text{If and only if } Q_d = Q_s$$

It should be necessary to note that two sense of the form equilibrium price.

(i) Intertemporal Sense (price being constant)

(2) Market clearing sense (The equilibrium price being one that equates Q_d and Q_s.

In the present model the two senses happens to coincide with each other. Now substituting demand and supply function in the above equation.

$$dP/dt = j(\alpha - \beta P + \gamma - \delta P)$$

$$dP/dt = j[(\alpha+\gamma) + (\beta P - \delta P)]$$

$$dP/dt = j[(\alpha+\gamma) - P(\beta+\delta)]$$

$$dP/dt = j[(\alpha+\gamma) - P(\beta+\delta)]$$

$$dP/dt = j(\alpha+\gamma) - j(\beta+\delta)P$$

$$dP/dt + \underbrace{j(\beta+\delta)P}_{a} = \underbrace{j(\alpha+\gamma)}_{b}$$

Since the co-efficient of P is non zero i.e $a \neq 0$ therefore the time path of price will be.

$$P(t) = \left[P(0) - \frac{\alpha+\gamma}{\beta+\delta}\right] e^{-j(\beta+\delta)t} + \frac{\alpha+\gamma}{\beta+\delta}$$

$$P(t) = P(0) - P^* \quad e^{-kt} + P^*$$

$$\left(\because k = j(\beta+\delta)\right)$$

hence

$$\boxed{P(t) = \left[P(0) - P^*\right] e^{-kt} + P^*}$$

$$\left(\because P^* = \frac{\alpha+\gamma}{\beta+\delta}\right)$$