## Indian Institute of Technology, Guwahati Mid Semester Examination. Industrial Organization HS 214

Full Marks: 45.
Time: Two hours.

All the questions are compulsory.

Suppose the utility function of a consumer is  $u(x_1, x_2)$ , where  $x_1$  is a normal good and  $x_2$  is a bad. A consumer gets dis-utility from the consumption of a bad. The income of the consumer is M, M > 0. The price of  $x_1$  is  $p_1$  per unit,  $p_1 > 0$ . The price of  $x_2$  is  $p_2$  per unit and  $p_2 > 0$ . Find the optimal consumption bundle of the consumer. What is the demand function of  $x_1$  of this consumer in this situation? Draw the demand function. (2+2+1)

Suppose the production function of a firm is  $f(l,k) = l^{\alpha} + k^{\beta}$ , where  $\alpha, \beta > 0$  and l is labour and k is capital. Suppose price of labour, wage rate is 10 per unit of labour. The price of capital, interest rate is 25. Derive the cost function of this firm. (6)

Suppose there are many firms producing a homogeneous product in a perfectly competitive market. Suppose the market demand function is 100-p=Q. The firms are similar in terms of cost function and it remains same in the long run. The cost function is  $c(q_i) = 2q_i^2 + f$ , f > 0. What is the supply curve of a firm in the short run? What is the long run output of a firm? How many firms are going to operate in the long run? (6)

Suppose the production function of a firm is  $f(l,k) = l^{0.5}k^{0.5}$  where l is labour and k is capital. The firm is a price taker in the input market where wage rate is 2 and price of capital is 4. Suppose the market demand of the product is 80 - 2p = q.

- (a) What is the output of a firm, if the market of this product is perfectly competitive and 10 similar firms are operating in it? Explain. (4)
- (b) What is the monopoly price and output if the firm is monopoly? (3)
- 5. Suppose there are two types of consumers and a monopolist in this market. The demand function of type 1 consumer is  $10 \alpha p_1 = q_1$ ,  $\alpha > 0$ . The demand function of type 2 consumer is  $20 p_2 = q_2$ . The cost of production is zero. Find a condition on  $\alpha$  so that the monopolist always able to do second degree price discrimination. (5)

- Suppose there is a monopolist. The monopolist can do third degree price discrimination. The demand function of market 1 is  $16 p_1 = q_1$  and the demand function of market 2 is  $10 \beta p_2 = q_2$ ,  $\beta > 0$ . The cost function of the monopolist is  $c(q) = q^2$ . Find the values of  $\beta$  such that the monopolist always charge higher price in market 2. (6)
- 7. Consider the following normal form game given in Figure 1. Find all the Nash equilibria of this game. (5)

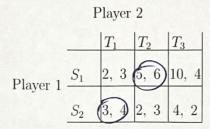


Figure 1: Pay-off matrix

28. Consider the following game normal form game given in Figure 2. Find all the Nash equilibria of this game. (5)

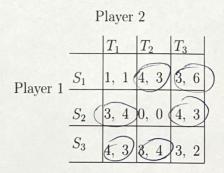


Figure 2: Pay-off matrix