

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

Full Marks: 45.  
Time: Two hours.

All the questions are compulsory.

- ✓1. 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)
- ✓2. 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)
- ✓3. 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)
- ✓4. 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)



- ✓ 6. 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)

|          |       | Player 2 |       |       |
|----------|-------|----------|-------|-------|
|          |       | $T_1$    | $T_2$ | $T_3$ |
| Player 1 | $S_1$ | 2, 3     | 5, 6  | 10, 4 |
|          | $S_2$ | 3, 4     | 2, 3  | 4, 2  |

Figure 1: Pay-off matrix

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

|          |       | Player 2 |       |       |
|----------|-------|----------|-------|-------|
|          |       | $T_1$    | $T_2$ | $T_3$ |
| Player 1 | $S_1$ | 1, 1     | 4, 3  | 3, 6  |
|          | $S_2$ | 3, 4     | 0, 0  | 4, 3  |
|          | $S_3$ | 4, 3     | 3, 4  | 3, 2  |

Figure 2: Pay-off matrix