INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

Mid-Spring Semester 2022-23

Date of Examination: 23.02.23 Session (FN/AN): AN Duration: 2 hours
Full Marks: 30 Subject No.: HS50019 Subject: ECONOMIC MODELLING
Department/Center/School: HUMANITIES & SOCIAL SCIENCES
Specific charts, graph paper, log book etc., required: None
Special Instructions (if any): **Answer all**

1. Consider a perfectly competitive market where each firm faces a total cost function $TC = 10 + 3q^2$ where q is the quantity produced. What will be the equilibrium price? (2)

2. There are two firms in an industry who face an inverse demand function $[P = 20 - Q]$ and a constant marginal cost of production $[c = 2]$. What will be the equilibrium price and quantity if these two firms compete in quantity? What will be their output decision(s) if they form a cartel? (3+3)

3. There are two markets (A and B) with demand elasiticities -1.7 and -3.4 respectively. A discriminating monopolist sets prices P_1 in A and P_2 in B without the fear of any arbitrage. If, P_1 is x% more than P_2, then, find the value of x. (2)

4. Consider durable-good monopoly facing a downward sloping demand given by $[P = 50 - Q]$. The consumers live for 2 periods. The monopolist incurs a constant marginal cost of production $[c = 5]$. What will be the monopolist's profit if it rents? What will the profit if the monopolist sells? (3+4)

5. The Organization of Petroleum Exporting Countries (OPEC) is a consortium of major oil-producing countries. OPEC was formed in 1961 and has tried since then to keep world oil prices high by restricting production levels (through production quotas on its members). Let's assume the number of real-world players being two – OPEC and the non-OPEC oil producing nations. The costs of production are $5 a barrel for OPEC and $10 a barrel for the non-OPEC producers. The world demand function for oil is given by $P = (65 - \frac{Q}{2})$, where, Q is the total output by both OPEC and non-OPEC producers. Find the best response functions for OPEC and non-OPEC countries. Find the equilibrium OPEC and non-OPEC outputs. What will be the equilibrium price(s)? (3+3+2)

6. Coke and Pepsi are the two dominant firms in the cola industry. The market size is $8 billion. Each firm can choose whether to advertise. Advertising costs $1 billion for each firm that chooses it. If one firm advertises and the other doesn't, then the former captures the whole market. If both firms advertise, they split the market 50:50 and pay for the advertising. If neither advertises, they split the market 50:50 but without the expense of advertising. What will be the outcome when the two firms move simultaneously? Draw the game tree for this game (assume that it is played sequentially), with Coke moving first and Pepsi following. What will be the outcome? (2+2+1)

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