BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc **SEMESTER : III**
BRANCH: QEDS **SESSION : MO/2025**

SUBJECT: ED203 INTERMEDIATE MICROECONOMICS

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1	Two firms producing bottled mineral water, Aquaflow and PureSpring, face the market demand function $Q = 120 - P,$ where Qdenotes the number of bottles sold, and $P$is the price per bottle. Both firms have identical cost functions given by: $$C_i(q_i) = 10q_i + 0.5q_i^2, i = A, P$$ where $q_i$is the output of each firm. (a) Initially, both firms behave as if the industry were perfectly competitive, choosing output where price equals marginal cost. Later, new managers recognize the duopoly structure and both switch to playing Cournot quantity competition. Compute the Cournot equilibrium outputs of Aquaflow and PureSpring and determine each firm's profit under Cournot. (b) Suppose now that Aquaflow correctly anticipates that PureSpring plays Cournot (i.e., PureSpring chooses its Cournot best-response), and therefore Aquaflow acts as a Stackelberg leader. Find the Stackelberg equilibrium outputs and each firm's profit. (c) Finally, assume the two firms agree to collude and jointly maximize total industry profit. They then divide output equally. Determine the collusive total output, the output per firm, and each firm's profit under collusion.	[3.5+3.5+3]	1	1 2 3
Q.2	Ranchi recently opened a new renewable-energy assembly plant that produces solar-battery storage units. The plant relies heavily on technicians who assemble and calibrate battery modules. The labour market for technicians is competitive, and both firms and workers are price takers. The industry's daily demand for technicians is described by: $L_D = 1500 - 15w$ where $L_D$is the number of technicians demanded per day and $w$is the daily wage rate in hundreds of rupees. The market supply of technicians is given by: $L_S = 30w$ (a) Determine the equilibrium wage rate and the equilibrium employment level in this labour market using a clearly labelled diagram of the labour market. (b) Illustrate the equilibrium and calculate the economic rent earned by technicians at equilibrium. Briefly interpret what this rent represents in the context of the labour market for specialised renewable-energy technicians.	[5+5]	2	3 5
Q.3	a. Consider the markets for electric vehicles (EVs) and EV charging stations, which are complementary goods. Suppose the government introduces a subsidy on electric vehicles, reducing their effective purchase price. Using this shock as an example, compare the partial equilibrium and general equilibrium approaches, explaining how each approach analyses the price and quantity adjustments, cross-market effects, and the final equilibrium outcome.	[5+5]	3	3 4 5

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b. Explain how a Social Welfare Function (SWF) can be used to judge whether a change in income distribution improves social welfare. Using a simple real-world situation—such as a government increasing social spending or improving access to public services—discuss how each of the four equity views would assess whether the policy is fair and welfare-enhancing.

Q.4 An art school runs a weekend fair where students barter goods they have created. Two students, Aarav and Maya, bring different items to trade: [3+3+4] 4 4 5

- Aarav brings sketchbooks (S) and paint tubes (P).
- Maya brings ceramic mugs (M) and paint tubes (P).

For simplicity, suppose the fair allows barter between only sketchbooks and paint tubes (mugs are irrelevant for trade here).
Their initial allocation of the two tradeable goods is as follows:

Individual	Initial Allocation
Aarav	5S, 3P
Maya	2S, 7P

During the fair, both students examine each other's work. Their marginal rates of substitution (MRS of sketchbooks for paint) at the initial allocation are:

- Aarav's MRS = 2 (he is willing to give up 2 paint tubes for 1 sketchbook)
- Maya's MRS = 0.5 (she is willing to give up only 0.5 paint tubes for 1 sketchbook)

(a) Using an Edgeworth-box framework, explain why the initial allocation is not Pareto efficient.
(b) Identify one possible mutually beneficial trade they could make. Clearly show how the trade moves them toward the contract curve.
(c) Propose a final allocation that is Pareto-superior to the initial one. State a possible common MRS at the efficient allocation and explain the condition for Pareto efficiency using MRS equality.

Q.5 a. Explain why labor markets have unemployment even though some workers are actively seeking work according to the efficiency wage theory (with proper diagram). [4+3+3] 5 4

b. In a market for dry cleaning, the inverse market demand function is given by $P = 100 - Q$, and the (private) marginal cost of production for the aggregation of all dry-cleaning firms is given by $MC = 10 + Q$. Finally, the pollution generated by the dry cleaning process creates external damages given by the marginal external cost curve $MEC = Q$.
i. Calculate the output and price of dry cleaning if it is produced under competitive conditions without regulation.
ii. Determine the socially efficient price and output of dry cleaning and the tax that would result in producing the socially efficient output.

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