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

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

SUBJECT: ED411 ADVANCED 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	A policy analyst is studying how urban households allocate their spending between: • X: units of public-transport rides, and • Y: units of app-based mobility services (ride-hailing). Because households value ride-hailing disproportionately when public-transport reliability falls, their preferences are modeled using: $$U(X,Y) = \ln(X + 2Y).$$ Let the prices of the two transport modes be $p_X$and p_Y, and let income be M. (a) Derive the expenditure function $E(p_X, p_Y, U)$for this utility function. (b) Using your expression for expenditure, derive the indirect utility function $V(p_X, p_Y, M)$. Then verify that the expenditure function can be obtained by *inverting* this indirect utility function, thereby confirming the duality relationship. (c) From the expenditure function, derive the Hicksian (compensated) demand functions for $X$and Y.	[3+4+3]	1	1 5
Q.2	A young entrepreneur has a constant absolute risk-averse utility function given by$U(w) = 1 - e^{-0.004w}$, where $w$is her final wealth. Her aunt gifts her a startup grant of ₹80,000. She decides to invest ₹20,000 of this amount in a risky tech prototype. The prototype's return is uncertain and yields: • ₹0 with probability 0.25, • ₹30,000 with probability 0.35, • ₹60,000 with probability 0.40. Compute her final wealth level in each possible outcome and the expected utility from this risky investment.	[5+5]	2	3 4
Q.3(a)	Consider a market with demand P= 90-Q. The incumbent firm has constant average and marginal cost of Rs.20. A potential entrant has constant average cost of Rs.25. If the entrant enters, it expects to capture **40%** of the total market demand and also requires the payment of a **fixed cost** of ₹200. a.Derive the zero-profit (break-even) condition for the entrant. b.Calculate the **limit price**, i.e., the highest price the incumbent can charge without inducing entry.	[2+3+5]	3	3 4
Q.3(b)	Two identical firms, **A** and **B**, are located at opposite points on a circular city of circumference 1 (so each half of the circle is 0.5 units long). Consumers are uniformly distributed with density 1 per unit distance and buy one unit each. Transportation cost per unit distance is t=10. Both firms have marginal cost, c=20. Derive the symmetric Nash equilibrium price. Two identical firms, **A** and **B**, are located at opposite points on a circular city of circumference 1 (so each half of the circle is 0.5 units long). Consumers are uniformly distributed with density 1 per unit distance and buy one unit each. Transportation cost per unit distance is t=10. Both firms have marginal cost, c=20. Derive the symmetric Nash equilibrium price.			

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Q.4	A logistics company, SwiftTrack Corp., hires freelance delivery agents who can be of two unobservable types: Efficient (E) or Inefficient (I). The company must assign delivery intensity levels $d \in \{d_H, d_L\}$. Each agent incurs a private cost of effort described by a non-linear type-dependent cost function: $$C_\theta(d) = \begin{cases} ad^2 - bd & \text{for type } \theta = E \\ ad^2 & \text{for type } \theta = I \end{cases}$$ where $a > 0$, $b > 0$, and the firm earns revenue $R(d) = \sqrt{d}$from delivery intensity d. i. Construct a (detailed and complete) screening model of adverse selection, and derive the first-best contract menu $(d_\theta^{FB}, w_\theta^{FB})$that the firm would offer if types were observable. ii. Show formally why the first-best menu becomes incentive-incompatible when agent type is private information.	[5+5]	4	3 5
Q.5(a)	"Every competitive equilibrium is Pareto efficient." Explain and justify this statement.	[5+5]	5	4 4
Q.5(b)	First Welfare Theorem fails to ensure a just or equitable outcome. Justify.			

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