

# Advanced Foundations of Game Theory

Game Theory · Answer Key · 12 Questions

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**1. In the context of the Nash Equilibrium, what condition must be satisfied for a strategy profile to be considered a pure strategy equilibrium?**

- A) Every player minimizes their expected cost regardless of opponents
- B) No player can unilaterally deviate to increase their payoff**
- C) All players must choose a randomized strategy with equal probability
- D) The sum of all players' payoffs must equal zero

**2. Which theorem states that every finite game with perfect information has a pure strategy Nash equilibrium that can be found by backward induction?**

- A) Zermelo's Theorem**
- B) Brouwer Fixed-Point Theorem
- C) Kuhn's Theorem
- D) Folk Theorem

**3. What does the 'Folk Theorem' in repeated games assert regarding the subgame perfect equilibrium outcomes?**

- A) Cooperation is impossible in games with finite horizons
- B) Equilibria are only possible if the discount factor is zero
- C) Any feasible, individually rational payoff can be sustained as an equilibrium with a sufficiently high discount factor**
- D) All equilibria must involve tit-for-tat strategies

**4. In cooperative game theory, what property must a solution satisfy if it is to be considered within the 'Core' of a game?**

- A) It must be computed using a Shapley value
- B) It must ensure that no coalition can improve its members' payoffs by acting independently**
- C) It must be unique and symmetric
- D) It must allow for side payments in all sub-games

**5. The Shapley value in cooperative game theory assigns a unique distribution of total surplus among players based on which mathematical concept?**

- A) Maximum Likelihood Estimation
- B) Average marginal contribution across all possible permutations**
- C) Minimax regret criteria
- D) Dynamic programming recursion

**6. Which theorem guarantees the existence of a Nash equilibrium in any finite game, provided mixed strategies are allowed?**

- A) Kakutani Fixed-Point Theorem
- B) Arrow's Impossibility Theorem
- C) Bolzano-Weierstrass Theorem
- D) Nash's Existence Theorem**

**7. In signaling games, what defines a 'Separating Equilibrium'?**

- A) All types of senders choose the same message
- B) Different types of senders choose different messages**
- C) The receiver ignores all signals provided by the sender
- D) The payoffs are zero for both sender and receiver

**8. What is the defining characteristic of a 'Global Game' as introduced by Carlsson and van Damme?**

- A) Perfect information with no uncertainty
- B) Strategic interaction under incomplete information about payoffs**
- C) A game played by more than 100 participants
- D) Equilibrium selection through irrational agents

**9. The 'Revelation Principle' in mechanism design states that any equilibrium outcome of a mechanism can be replicated by an equilibrium of which type of mechanism?**

- A) Direct-revelation mechanism**
- B) Iterative bidding mechanism
- C) Stochastic auction mechanism
- D) Bayesian-Nash mechanism

**10. What is the primary function of the 'Trembling Hand Perfect Equilibrium' refinement?**

- A) To eliminate non-credible threats by accounting for the possibility of small implementation errors**
- B) To calculate the maximum possible payoff in an infinite game
- C) To ensure that all players move simultaneously
- D) To enforce collusion among all players

**11. In the context of evolutionary game theory, what is an Evolutionarily Stable Strategy (ESS)?**

- A) A strategy that is immune to invasion by any mutant strategy**
- B) A strategy that changes constantly over time
- C) A strategy that always results in a tie
- D) A strategy that requires human cognitive intervention

**12. What does the 'Price of Anarchy' quantify in a game-theoretic model?**

- A) The total number of players in a system
- B) The efficiency loss caused by selfish behavior compared to a social optimum**
- C) The transaction costs associated with forming a cartel
- D) The inflation rate in a barter economy