Cosmic Game Theory Dynamics

Game Theory · Practice Test · 10 Questions

1. In the context of the 'Kessler Syndrome' as a non-cooperative game, what is the primary factor that makes debris mitigation a 'tragedy of the commons' problem for orbital states?

A) The lack of a centralized enforcement agency to penalize satellite operators for generating space junk
B) The physical impossibility of tracking objects smaller than 10cm in Low Earth Orbit
C) The exponential rate of atmospheric drag on objects below 500km altitude
D) The requirement for geostationary orbit to be cleared of all defunct satellites

2. Which game theory model best describes the strategic competition between nations to claim lunar poles for water-ice extraction, given that resource depletion is irreversible?

A) The Stag Hunt
B) The War of Attrition
C) The Dictator Game
D) The Traveler's Dilemma

3. When modeling the 'Fermi Paradox' as a game, what is the 'Dark Forest' theory's core assumption regarding communication between advanced civilizations?

A) Information transfer is subject to the speed of light, making coordination impossible
B) Any civilization that reveals its location is immediately perceived as a threat and eliminated
C) Resource scarcity in the universe is absolute, leading to zero-sum conflict
D) Communication is inhibited by the gravitational lensing of distant galactic centers

4. In orbital rendezvous maneuvers modeled as pursuit-evasion games, what prevents a simple linear intercept strategy?

A) The conservation of angular momentum forcing non-linear Hohmann transfer trajectories
B) The requirement to maintain a constant relative phase angle in a vacuum
C) The influence of third-body perturbations on the target's trajectory
D) The non-Euclidean geometry of curved spacetime near massive bodies

5. Which strategic concept explains why global satellite constellations (like Starlink) prioritize rapid deployment to secure orbital slots, effectively creating a 'first-mover advantage'?

A) Nash Equilibrium
B) Stackelberg Competition
C) Pareto Efficiency
D) The Prisoner's Dilemma

6. In the 'Interstellar Colonization' game, why is a high discount rate on future rewards problematic for the survival of humanity?

A) It incentivizes the consumption of local planetary resources before reaching a self-sustaining population
B) It ignores the relativistic time dilation experienced by interstellar travelers
C) It results in the neglect of long-term life-support maintenance on generation ships
D) It favors the development of autonomous AI over biological reproduction

7. What is the primary constraint that prevents 'Cooperative Game Theory' from effectively managing the allocation of radio frequencies for deep-space telemetry?

A) The vast communication latency preventing real-time negotiation between distant observatories
B) The international law governing radio wave propagation in vacuum
C) The inability of non-state actors to participate in ITU negotiations
D) The dominance of ionospheric interference on deep-space signals

8. When applying the 'Braess's Paradox' to interplanetary transport networks, what is the counterintuitive result of adding a new orbital transfer point?

A) The reduction of total transit time for all spacecraft in the system
B) The congestion of high-efficiency Hohmann transfer windows
C) The increase in total transit time due to a shift in impulsive maneuver allocation
D) The destabilization of stable Lagrange point orbits

9. In the strategic interaction of 'Interplanetary Trade' between Earth and Mars, what factor dictates the game's move-set limitations?

A) The specific orbital resonance windows occurring approximately every 26 months
B) The constant solar wind pressure affecting light-sail transport
C) The high cost of heavy-lift rocket fuel per kilogram
D) The gravitational constant discrepancy between planets

10. Why is the 'Zero-Sum' assumption frequently applied to the acquisition of rare-earth elements on asteroids?

A) The asteroids contain a finite volume of extractable material
B) The cost of asteroid mining exceeds the value of the materials recovered
C) The legal status of asteroid minerals is limited to the first explorer who touches the surface
D) The rapid decay of isotopes used for asteroid propulsion systems