Algorithmic Game Theory
Assignment 5

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1. Which of the following problems belong to the complexity class PLS?

    (a) Finding a PSNE in a strategic form game.
    (b) Finding a PSNE in a potential game.
    (c) Finding an MSNE in a strategic form game.
    (d) Finding a VWDSE in a strategic form game.

    The correct answer is (b).

2. Which of the following statements is correct?

    (a) FNP is a subclass of PPAD
    (b) TFNP is a subclass of PPAD
    (c) NP is a subclass of PPAD
    (d) PLS is a subclass of PPAD

    The correct answer is (d).

3. Finding an MSNE is not computationally intractable for which of the following class of games?

    (a) two player constant-sum game (here the sum of utilities of all the players in every strategy profile is some constant, independent of the strategy profile)
    (b) two-player strategic form game
    (c) multi-player zero-sum game (here the sum of utilities of all the players in every strategy profile is zero)
    (d) bi-matrix game

    The correct answer is (a).

4. Which of the following problems is known PPAD-complete?

    (a) PSNE problem in a congestion game
    (b) PSNE problem in a network congestion game
    (c) Sperner's problem
    (d) MSNE problem in a two-player zero-sum game

    The correct answer is (c).

5. Which of the following problems does not belong to the complexity class PPAD?

    (a) Integer factoring problem
    (b) PSNE problem for a congestion game
    (c) PSNE problem for a network congestion game
    (d) PSNE problem for a symmetric game

    The correct answer is (a).

6. Which of the following problems is not a total problem?

    (a) PSNE problem for a congestion game
    (b) PSNE problem for a network congestion game.
    (c) PSNE problem for a bi-matrix game.
    (d) MSNE problem for a bi-matrix game.

    The correct answer is (c).

7. For which of the following games, the best-response dynamic may not converge?

    (a) Zero-sum game.
    (b) Congestion game.
    (c) Network congestion game.
    (d) Finite potential game.

    The correct answer is (a).

8. For which of the following games, finding an ε-MSNE is PPAD-complete?

    (a) symmetric games
    (b) zero-sum game
    (c) constant-sum game
    (d) Network congestion game with same source and destination and bounded jumps

    The correct answer is (a).

9. For which of the following games, an MSNE can be computed in polynomial time?

    (a) Congestion game
    (b) Zero-sum game
    (c) Symmetric game
    (d) Symmetric congestion game

    The correct answer is (b).

10. Which of the following statements is wrong?

    (a) If a problem is PLS-complete, then it is also PLS-hard.
    (b) If a problem is PPAD-complete, then it is also PPAD-hard.
    (c) If a problem is PLS-hard, then it is also PLS-complete.
    (d) If a problem is FNP-complete, then it is also FNP-hard.

    The correct answer is (c).