

Dr. Pratyekha  
12/12/2022  
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Branch/Semester: BTech DD (4<sup>th</sup> Year)  
Semester: 7<sup>th</sup>  
Duration: 3 hrs  
Date: 12/12/2022

Subject Name: Game Theory  
Subject code: CS-723  
Max Marks: 50  
Time: 02:30 PM – 05:30 PM

**Note: All questions are compulsory.**

1. There are two traders (1 and 2) in a market who have to decide between 'Aggressive' behaviour or 'Passive' behaviour. The payoffs that each player receives depend on the action of the other player and are summarised in the following normal form.

		2	
		A	P
1	A	(1, 1)	(3, 2)
	P	(2, 4)	(4, 3)

- (a) Suppose first that the traders decide on their action simultaneously. Does any player have a dominant strategy in the game? What is the Nash equilibrium? [4]
- (b) Now suppose that trader 1 moves first and, after observing the action of trader 1, trader 2 makes her decision. Construct the extensive form of the game and find the sub-game perfect Nash equilibrium using the process of backward induction. [4]
- (c) What is the normal form of this sequential-move game? Find all Nash equilibria of the game using best response analysis. [4]
- (d) Are there any Nash equilibria that are not subgame-perfect? Discuss. [4]
- (e) Is there anything striking about the equilibrium when the game is played sequentially compared to that when the game is played simultaneously? Discuss [4]
2. What can be the effects of artificial intelligence implemented for computer games? [4]
3. Can game theory be used in the process of improving teaching techniques in education systems? Which game theory technique will more efficiently be used for this purpose? Justify your answer [6]
4. Two players, Row and Column, are driving toward each other on a one-lane road. Each player chooses simultaneously between going straight (S), swerving left (L), and swerving right (R). If one player goes straight while the other swerves, either right or left, the one who goes straight gets payoff 3 while the other gets -1. If each player swerves to his left, or each swerves to his right, then each gets 0 (remember, they are going in opposite directions). If both go straight, or if one swerves to his left while the other swerves to his right, then the cars crash and each gets payoff -4.
- (a) Write the payoff matrix for this game. [4]
- (b) Find all of the game's rationalizable strategies for each player. [4]
- (c) Find all of the game's Nash equilibria in pure strategies. [4]
- (d) Find a Nash equilibrium in which Row uses a pure strategy and Column mixes between two of his strategies. Clearly identify which strategy or strategies have positive probabilities for each player, and what Column's mixing probabilities are. [4]
- (e) Find a Nash equilibrium in which both Row and Column mix between two of their strategies. Clearly identify which strategies have positive probabilities for each player, and their mixing probabilities are. [4]