Q. Code:810902

Reg. No. | | | | | | | | | | | | | |

B.E./ B. TECH.DEGREE EXAMINATIONS, MAY 2024

Eighth Semester

AD18010 – GAME THEORY

(Computer Science and Engineering)

(Regulation 2018/2018A)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Provide solutions for strategic environments.	**3**
CO 2	Identify various game learning types.	**3**
CO 3	Build Multi agent system using cooperative game theory.	**3**
CO 4	Identify suitable strategic algorithm for distributed environment.	**3**
CO 5	Recommend and apply suitable game theory strategy to solve real world problems.	**5**

PART- A (10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Define expected utility of a mixed strategy in normal-form games. Give an example.	**1**	**1**
2.	Discuss the significance of Nash equilibrium.	**1**	**2**
3.	Define pure strategy for perfect-information game. Give example.	**2**	**1**
4.	How myopic best response strategy plays a significant role in congestion games?	**2**	**3**
5.	Define regret and no regret learning rules.	**3**	**1**
6.	Differentiate descriptive and prescriptive theories.	**3**	**2**
7.	Illustrate the significance of Shapley values in cooperative game theory.	**4**	**3**
8.	Compare and contrast traditional auction and reverse auction.	**4**	**3**
9.	Define contract nets and list its advantages.	**5**	**4**
10.	Define principle of optimality in path-planning.	**5**	**4**

PART- B (5x 14=70Marks)

		Marks	CO	RBT LEVEL
11. (a)	Discuss and compute the pure and mixed strategy Nash Equilibrium for the following games.	**(14)**	**1**	**3**

Player 1

Player 2		L	R
	U	1,1	0,2
	D	2,0	1,1

Player 1

	L	R
U	3,3	1,2
D	2,1	2,2

Player 1

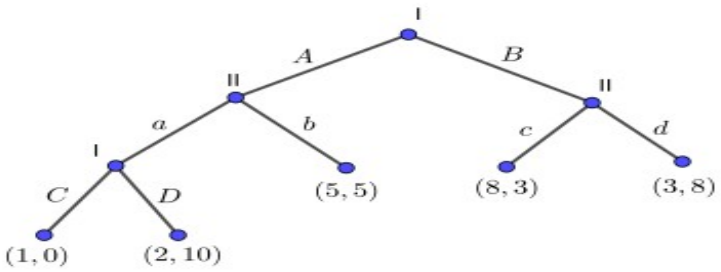
	O	F
O	3,2	0,0
F	0,0	2,3

(OR)

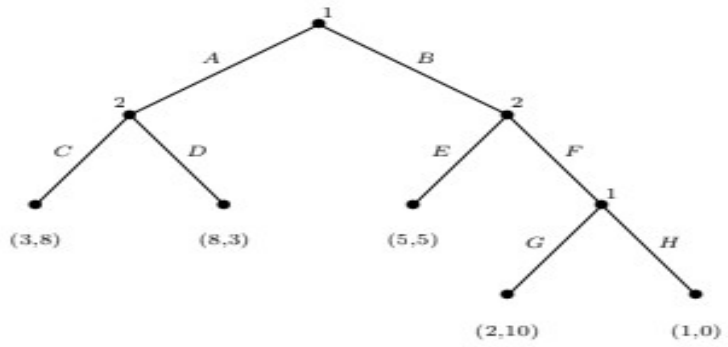
(b) Write the properties and pseudocode of the Lemke–Howson algorithm for complementarity pivoting. Solve the LCP Problem using Lemke–Howson algorithm. **(14)** **1** **3**

	Player 2	
	2,1	0,2
	1,0	3,1
	0,2	1,3

12. (a) **(i)** Elaborate the backward induction algorithm for computing equilibria for n- player, general-sum perfect-information extensive-form games. Derive the Nash equilibrium for the below extensive-form game. **(10)** **2** **3**



(ii) Convert the below extensive form game to a normal game. **(4)** **2** **3**



(OR)

(b) **(i)** Compute the expected payoff of both players and compute atleast one Bayesian Nash equilibrium from the calculated expected payoff for the below game. **(7)** **2** **3**

Probability of player 2 of Type x = 2/3

	Player 2 Type x		
Player 1		I	D
	A	4,3	3,1
	B	3,6	2,3

Probability of player 2 of Type y = 1/3

	Player 2 Type y		
Player 1		I	D
	A	3,3	1,6
	B	1,1	5,3

(ii) Construct the extensive-form tree representation for repeating the below game for two times with the corresponding payoff values. **(7)** **2** **3**

Player 1

Player 2		C	D
	C	$-1,-1$	$-4,0$
	D	$0,-4$	$-3,-3$

13. (a) How fictitious play is applied in the context of repeated games? Discuss an example of a game where fictitious play fails to converge. **(14)** **3** **3**

(OR)

(b) Discuss "Doing by talking" and "Talking by doing" mechanisms in **(14)** **3** **3**

signaling games.

			Marks	CO	RBT LEVEL
14. (a)		Discuss auctions as Bayesian mechanism for any two single-good and two multiunit auctions with examples.	**(14)**	**4**	**3**
		(OR)			
	(b)	Discuss the various types of coalitional games. Illustrate the different types of payoff mechanisms and methods for analyzing coalitional games.	**(14)**	**4**	**3**
15. (a)		Explain the domain pruning algorithms in distributed constraint satisfaction problem with suitable examples.	**(14)**	**5**	**2**
		(OR)			
	(b)	Explain naïve auction algorithm. Discuss the flaw in naïve auction algorithm and the method to overcome the flaw.	**(14)**	**5**	**2**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

			Marks	CO	RBT LEVEL
16.	**(i)**	Alice faces three choices: going to the club (c), a movie (m), or staying home (h). Alone, Alice's utilities are 100 for c, 50 for m, and 50 for h. However, interactions with Bob, her enemy, yield disutilities of 40 if at the movies and 90 if at the club. Bob is at the club 60% of the time. Alice's friend Carol boosts utility by 1.5x. Carol is at the club 25% and the movie theater 75% of the time. Alice's utility is consistently 50 at home. Given these factors, Evaluate Alice's expected utility and help her choose among the activities?.	**(5)**	**5**	**5**
	(ii)	In the context of the classic game Rock, Paper, Scissors, where two players simultaneously choose one of three options (rock, paper, or scissors), how can one identify the Nash equilibrium strategies for both players, considering the payoffs associated with each possible outcome and the rational decision-making behavior of both players under uncertainty?	**(5)**	**5**	**5**

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