**Question -1**

**Consider the normal form :**

* **N={1,2}**
* **Each player choose an action of either going to movie or going to the theater .**
* **Player 2 prefers to go to the theater with player 1 over seeing a movie with player1**
* **Players gets a payoff of 0 if they end up at a different place than the other player .**

|  |  |  |
| --- | --- | --- |
| **Player1/player2** | **Movie** | **Theater** |
| **Movie** | **a,b** | **0,0** |
| **Theater** | **0,0** | **C,d** |

**Which restriction should a,b ,c and d satisfy?**

* **a>c,b>d**
* **a>d,b<c**
* **a>c,b<d**
* **a<c.b<d**

**Question -2**

**Consider the following constant-sum game:**

|  |  |  |
| --- | --- | --- |
|  | **H** | **T** |
| **H** | **1,-1** |  |
| **T** |  | **0,?** |

**What should be filled in?**

**a)-1**

**b)0**

**c)1**

**d)2**

**Question – 3**

**N people guess an integer between 1 and 100 and the winner is the player whose guess is closest to the guesses +1 . Which of the following is an equilibrium:**

**a) All announce 1**

**b) All announce 50**

**c) All announce 75**

**d) All announce 100**

**Question -4**

**Consider the collective –action game:**

|  |  |  |
| --- | --- | --- |
| **Player1/ player 2** | **Revolt** | **Not** |
| **Revolt** | **2,2** | **-1,1** |
| **Not** | **1,-1** | **0,0** |

**When player 1 plays Not for player 2**

1. **Revolt is best response**
2. **Not is a best response**
3. **Revolt and Not are both best response**
4. **There is no best response**

**Question- 5**

**Consider the following game in which two firms must decide whether to open a new plant or not :**

|  |  |  |
| --- | --- | --- |
| **Firm 1/Firm 2** | **Build** | **Not** |
| **Build** | **1,1** | **3,0** |
| **Not** | **0,3** | **2,2** |
|  |  |  |

**Find all pure strategy Nash equilibrium .**

**a)Only (Build,Not)**

**b) Only (Not ,Not)**

**C) Only (Biuld,Build)**

**d)Only ( Not, Biuld)**

**Question 6:**

**Consider game :**

|  |  |  |
| --- | --- | --- |
| **Player1/player 2** | **Left** | **Right** |
| **Up** | **2,1** | **1,1** |
| **Down** | **0,1** | **0,2** |

**Which of the players has a strictly dominant strategy?**

**a)player 1 b) player 2 c) both player d) Neither player**

**Question -7**

**Consider game :**

|  |  |  |
| --- | --- | --- |
| **Player 1/Player2** | **Left** | **Right** |
| **Left** | **3,3** | **1,1** |
| **Right** | **1,4** | **1,1** |

**Which of the following outcomes is pareto –optimal ?**

**a)(3,3) b)(1,4) c)(1,1)**

**Questions 8:**

**Find the dominant strategy:**

|  |  |  |  |
| --- | --- | --- | --- |
| **½** | **x** | **y** | **z** |
| **A** | **1,2** | **2,2** | **5,1** |
| **B** | **4,1** | **3,5** | **3.3** |
| **C** | **5,2** | **4,4** | **7,0** |
| **D** | **2,3** | **0,4** | **3,0** |

**1)a 2)b 3)c 4) d 5)x 6)y 7)z**

**Question 9:**

|  |  |  |  |
| --- | --- | --- | --- |
| **½** | **x** | **y** | **z** |
| **A** | **1,2** | **2,2** | **5,1** |
| **B** | **4,1** | **3,5** | **3,3** |
| **C** | **5,2** | **4,4** | **7,0** |
| **D** | **2,3** | **0,4** | **3,0** |

**Find a very weakly dominant strategy that is not strictly dominant :**

**1)a 2)b 3)c 4) d 5)x 6)y 7) z**

**Question 10:**

**When player 1 plays d what is player 2’s best response :**

|  |  |  |  |
| --- | --- | --- | --- |
| **½** | **x** | **y** | **z** |
| **A** | **1,2** | **2,2** | **5,1** |
| **B** | **4,1** | **3,5** | **3,3** |
| **C** | **5,2** | **4,4** | **7,0** |
| **D** | **2,3** | **0,4** | **3,0** |

1. **Only x b )only y c) only z d)both y and z**

**Question 11:**

**Find strategy profiles that from pure strategy nash equilibriua (there may be than one or more)**

**1)(a,x) 2)(b,x) 3)(c,x) 4)(d,x) 5) (a,y) 6) (b,y) 7)(c,y) 8)(d,y) 9)(a,z) 12)(b,z) 11)(c,z)**

**12)(d,z)**

**Question 12:**

**There are 2 players that have to decide how to split one dollar .The bargaining process works as follow s.Players simultaneously announce the share they would like to recive**

**Question 12 :There are 2 players that have to decide how to split one dollar.The bargaining process works as follow . Players simultaneously announce the share they would like to recive**

**and with then players recive the shares they named and if then both players fail to achieve an agreement and receive zero.**

**Which of the following is following is a strictly dominant strategy?**

1. **1 b)0.5 c)0 d)none of the above**

**13) Two firms produce identical goods with a production cost of c>0 per unit.**

**Each firm sets a nonnegative price (**

**All consumer buy from the firm with lower price if .Half of the consumers buy from each firm .**

**D is total demand**

**Profit of firm I is :**

0 if  **no one buy from I**

**Half of customer buy from firm i**

**all customer buy from firm i**

**the pure strategy Nash equilibrium :**

1. **Both firms set p=c**
2. **Firm 1 set p=0 and firm**
3. **Both firms set p=c**
4. **No pure strategy Nash equilibrium**

**Question 14:**

**The voters vote over two candidates (A,B) and each voter has two pure strategies :vote for A and vote for B .When A wins voter gets a payoff of 1 and 2 and 3 get payoffs of 0: when B wins 1 gets 0 and 2 and 3 get 1.Thus 1 prefers A and 2 and 3 prefer B.**

**The candidates getting 2 or more votes is winner ( majority rule)**

**Find all very weakly dominant strategies (there may be more than one or none)**

**a)voter 1 voting for A**

**b) voter 1 voting for B**

**c)voter 2 or 3 voting 3**

**d)voter 2 or 3 voting for B**

**Question-15:**

* **Three voters over two candidates (A and B) and each voter has two pure strategies: Vote for A and vote for B**
* **When A wins voter 1 gets payoff of 1 and 2 and 3 get pay off 0 when B wins 1 get 0 and 2 and 3 get 1 .Thus 1 prefers A and 2 and 3 prefer B**
* **The candidate getting 2 or more votes is the winner**

**Find all pure strategy Nash equilibria (there will be more than one or none )?**

**a)all voting for A**

**b)all voting for B**

**c)1 voting for A and 2 and 3 voting for B**

**d)1 and 2 voting for A and 3 voting for B.**

**16) consider the predator /pay game with a mixed strategy:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Mixed** |  | **p** | **1-p** |
|  | **Perd/pery** | **Active** | **Passive** |
| **Q** | **active** | **2,-5** | **3,-6** |
| **1-q** | **passive** | **3,-2** | **-1,0** |

**What are p and q in a mixed –strategy equilibrium ?(hint : payoff of the predator when playing active is 2p+3(1-p):when playing passive is 3p-(1-p).payoffs should be equal since the predator should be indifferent.**

**a)2/3,1/2**

**b)2/5,1/3**

**c)4/5,3/5**

**d)4/5,2/3**

**17) Consider the penalty kick game with a very accurate kicker :**

|  |  |  |  |
| --- | --- | --- | --- |
| **mixed** |  | **p** | **1-p** |
|  | **Kicker/goalie** | **Left** | **right** |
| **Q** | **left** | **0,1** | **1,0** |
| **1-q** | **right** | **1,0** | **0,1** |

**What are p and q in a mixed strategy equilibrium?(payoff of the kicker when playing left is 0p+(1-p) when playing right is p+0(1-p). Payoff should be equal since the kicker should be indifferent)**

**a)1/2,3/4**

**b)3/4,1**

**c)1/2,1/2**

**4)3/4,3/4**

**18)Consider the following game**

|  |  |  |
| --- | --- | --- |
| **1/2** | **L** | **R** |
| **T** | **2,2** | **0,2** |
| **B** | **1,2** | **3,3** |

**Find all pure strategy and mixed strategy Nash equilibrium :**

**a)(T,L)**

**b)(B,R)**

**c) player 1 plays T with prob q=1 player 2 playes L with prob p=3/4**

**d) all of the above**

**19) Find a mixed strategy Nash equilibrium where player 1randomies over the pure strategy left and right with probability p for left . what is p?**

**A)1/4**

**b)3/4**

**c)1/2 d)2/3**

**20)In a mixed strategy Nash equilibrium where player 1 plays Left with probability p and player 2 playes left with probablityq .how do p and q change as x increased X>1?**

**a)p is the same ,q decreases**

**b)pincreases q increases**

**c)p decreases q decreases**

**d) p is the same q increases**

**21)**

* **There are 2 firm each advertising an available job opening .**
* **Forms are offer different wages :firm1 offer =4 and 2 offers**
* **There are two unemployed workers looking for jobs. They simultaneously apply to either of the firms .**
* **If both worker apply to the a firm the he/she gets the job**
* **If both workers apply to the same firm the firm hires a worker at random and the other worker remains unemployed (and receives a payoff of 0)**

**Find a mixed strategy Nash Equilibrium where p is the probability that worker 1 applies to firm 1 and q is the probability that worker 2 applies to firm 1.**

**a)p=q=1/2**

**b)p=q=1/3**

**c)p=q=1/4**

**d)p=q=1/5**

**22)**

**A king is deciding where to hide his treasure, while a pirate is deciding where to wolook for the treasure.**

**The payoff to the king from successfully hiding the treasure is 5 and from having it found is 2.**

**The payoff to the pirate from finding the treasure is 9 and from not finding is 4.**

**The king can hide it in location X,Y or Z**

**Suppose the pirate has two pure strategies: inspect both X and Y ( they are close together ),or just inspect Z (it is far away).Find a mixed strategy Nash equilibrium where p is probability the treasure is hidden in X or Y and 1-p that it is hidden in Z ( treat the king having two strategies) and q id the probability that the inspects X and Y.**

**a)p=1/2,q=1/2**

**b)p=4/9, q=2/5**

**c)p=5/9,q=3/5**

**d0p=2/5,q=4/9**

**23)**

**A king is deciding where to hide his treasure while a pirate is deciding where to look for treasure**

**The payoff to the king from successfully hiding the treasure is 5 and from having it found is 2**

**The payoff to the pirate from finding the treasure is 9 an from not finding is 4.**

**The king can hide it in location X ,Y or Z.**

**Suppose instead that the pirate can investigate any two location so has three pure strategies:**

**Inspect XYor YZ or XZ.Find a mixed strategy Nash equilibrium where the king mixes over three location (X,Y,Z) and the pirate mixes over (XY,YZ,XZ).The following probabilities (King) from an equilibrium:**

**a)(1/3,1/3,1/3).(4/9,4/9,1/9)**

**b)(4/9.4/9,1/9),(1/3,1/3,1/3)**

**c)(1/3,1/3,1/3),(2/5,2/5,1/5)**

**d)(1/3,1/3,1/3),(1/3,1/3,1/3)**

**24 ) Consider the game:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Player1/player2** | **u** | **m** | **d** |
| **U** | **2,1** | **5,3** | **3,1** |
| **M** | **6,7** | **2,1** | **0,0** |
| **D** | **5,0** | **1,1** | **2,4** |

**Which pair of strategies survives the process of iterative removal of strictly dominated strategies?**

**a)(U,u)**

**b)(U,m)**

**c)(M,u)**

**d)(D,d)**

**25)Consider the game**

|  |  |  |
| --- | --- | --- |
| **Player1/player2** | **movie** | **Home** |
| **Movie** | **3,0** | **1,2** |
| **Home** | **2,1** | **0,3** |

**Which is a maximum strategy for player 1:**

1. **Play Movie**
2. **Play Home**
3. **Play movie**
4. **Play movie with 1/3 and home with 2/3**

**26)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Normal** |  |  |  |
|  | **L** | **M** | **R** |
| **U** | **3,8** | **2,0** | **1,2** |
| **D** | **0,0** | **1,7** | **8,2** |

**We say that a game is dominance solvable if iterative deletion of strictly dominated strategies yields a unique outcome.True or false :**

**Is the previous game dominance solvable? Consider both pure and mixed strategies.**

**a)True b)False**

**27)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Norma** |  |  |  |
|  | **L** | **M** | **R** |
| **U** | **4,3** | **3,5** | **3,5** |
| **D** | **3,4** | **5,3** | **3,4** |
|  |  |  |  |

**In order to illustrate the problem that arises when iteratively eliminating weakly dominated strategies consider the game :**

**True or false: in the above game the order of elimination of weakly dominated strategies dose inal outcome is the same regardless of the order in which weakly dominated strategies are eliminated).**

**a)True b)False**

**28)Consider matching –pennies game:**

|  |  |  |
| --- | --- | --- |
| **1/2** | **left** | **right** |
| **left** | **2,-2** | **-2,2** |
| **right** | **-2,2** | **2,-2** |

**Is there dominated strategy –Nash equlibrum?find BR of each player.**

**29)**

|  |  |  |
| --- | --- | --- |
| **1/2** | **B** | **F** |
| **B** | **2,1** | **0,0** |
| **F** | **0,0** | **1,2** |
|  |  |  |

**Consider the following assignment dedvice (for example fair coin)**

**With probability 1/2it tells player 1and 2to play B,and with probability ½ it tells them to play F.**

**Both players know that the device will follow this rule.**

**What is the expected payoff of each player when both players follow the recommendations made by the device ?If one of players follows the recommendationdose other player have an intencive to follow the recommendations as well:**

**a)Expected payoff =2, player has incentive to follow the recommendation**

**b)Expected payoff =1,player does not an incentive to follow the recommendation.**

**c)Expected payoff =1.5 player has an incentive to follow the recommendation.**

**d)Expected payoff = 1.5 player does not have an incentive to follow the recommendation.**

**30)Consider the rock –paper –scissor game:**

|  |  |  |  |
| --- | --- | --- | --- |
| **1/2** | **Rock** | **Paper** | **Scissors** |
| **Rock** | **0,0** | **-1,1** | **1,-1** |
| **paper** | **1,-1** | **0,0** | **-1,1** |
| **Scissor** | **-1,1** | **1,-1** | **0,0** |

**Find dominated ,nash ,and best response?**

**31)**

|  |  |  |  |
| --- | --- | --- | --- |
| **1/2** | **x** | **y** | **z** |
| **x** | **2,5** | **2,1** | **0,1** |
| **y** | **3,2** | **4,4** | **1,1** |
| **z** | **1,0** | **1,1** | **1,2** |
|  |  |  |  |

**Find the strictly dominated strategies ( they may be zero or more).**

**a)y b)z c)c d) a e)b**

**32)**

|  |  |  |  |
| --- | --- | --- | --- |
| **1/2** | **x** | **y** | **z** |
| **x** | **2,5** | **2,1** | **0,1** |
| **y** | **3,2** | **4,4** | **1,1** |
| **z** | **1,0** | **1,1** | **1,2** |
|  |  |  |  |

**Which strategies survive the process of iterative removal of strictly dominated strategies(there may be zero, one , or more)**

**1)a 2)c 3)z 4)x 5)y 6)b**

**33)**

|  |  |  |  |
| --- | --- | --- | --- |
| **1/2** | **x** | **y** | **z** |
| **x** | **2,5** | **2,1** | **0,1** |
| **y** | **3,2** | **4,4** | **1,1** |
| **z** | **1,0** | **1,1** | **1,2** |
|  |  |  |  |

**Find all strategy profiles that from that pure strategy Nash equlibria ( there may be zero ,one ,or more)**

**1)(a,x) 2)(a,y) 3) (a,z) 4) (b,x) 5)(b,y) 6)(b,z) 7) (c,x) 8) (c,y) 9 ) (c,z)**