BCS-6L

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Date: M T W

Assignment # 2
Artificial Intelligence.

Question # 2 : Dry Run for Genetic Algorithm.

Data:

Times:

$T_1 : 8,\ T_2 : 4;\ T_3 : 7,\ T_4 : 6,\ T_5 : 3,\ T_6 : 9,\ T_7 : 5.$

Facility Capacity:

$F_1 : 24,\ F_2 : 30,\ F_3 : 28.$

According # to be given Cost Matrix.

Cost Calculation: Cost = Cost/hour * Task time.

GA Parameters:

Pop Size: 6 chromosomes.

Crossover Rate: 80%

Mutation Rate: 20%.

Selection: Rullete wheel.

Crossover: One point.

Mutation: Swap-Mutation.

Fitness: Total Cost + penalty (if capacity violated, penalty = 1000 on excess hr

Initial Population:

CH1 [1, 1, 1, 1, 1, 1, 1] CH2 [2, 2, 2, 2, 2, 2, 2] CH3 [3, 3, 3, 3, 3, 3, 3] CH4 [1, 2, 3, 1, 2, 3,

CH5 [2, 3, 1, 3, 1, 2, 3] CH6 [3, 1, 2, 3, 1, 2, 3]

Fitness:

CH1 = Cost = 446, Penalty = 18000, Fitness = 18446.

CH2 = C = 446, P = 12000, F = 12446

CH3 = C = 454, P = 14000, F = 14454.

CH4 = C = 441 F = 441 | CH5 = C = 453, F = 453 | CH6 = C = 452,

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Step 2: Selection (Roulette Wheel)

$p_i = (1/\text{fitness}_i) / \Sigma(1/\text{fitness}_j)$

$p1 = 0.0079$, $p2 = 0.0117$, $p3 = 0.0100$, $p4 = 0.3291$, $p5 = 0.3203$, $p6 = 0.3210$

pairs: (Ch4, Ch6), (Ch5, Ch4), (Ch4, Ch5)

Step 3: Crossover (80%).

i) (Ch4 & Ch6). Point = 4

O1: [1, 2, 3, 1, 1, 2, 3], O2: [3, 1, 2, 3, 2, 3, 1].

ii) (Ch5, Ch4), Point = 2

O3: [2, 3, 3, 1, 2, 3, 1]; O4: [1, 2, 1, 2, 3, 1, 2].

iii) (Ch4, Ch5): Point = 5

O5: [1, 2, 3, 1, 2, 1, 2], O6: [2, 3, 1, 2, 3, 3, 1].

Step 4: Mutation (20%)

O2: SWAP T2 & T5 -> [3, 2, 2, 3, 1, 3, 1]

O3: SWAP T1 & T4 -> [1, 3, 3, 2, 2, 3, 1]

O6: SWAP T4 & T7 -> [2, 3, 1, 1, 3, 3, 2]

Rest, No Mutation.

Step: 6: New population:

O1: 436, O2: 456, O3: 437, O4: 429 (best), O5: 437, O6: 474.

Finitial Best: 441 (Ch4)

New best: 429 (O4: [1, 2, 1, 2, 3, 1, 2].

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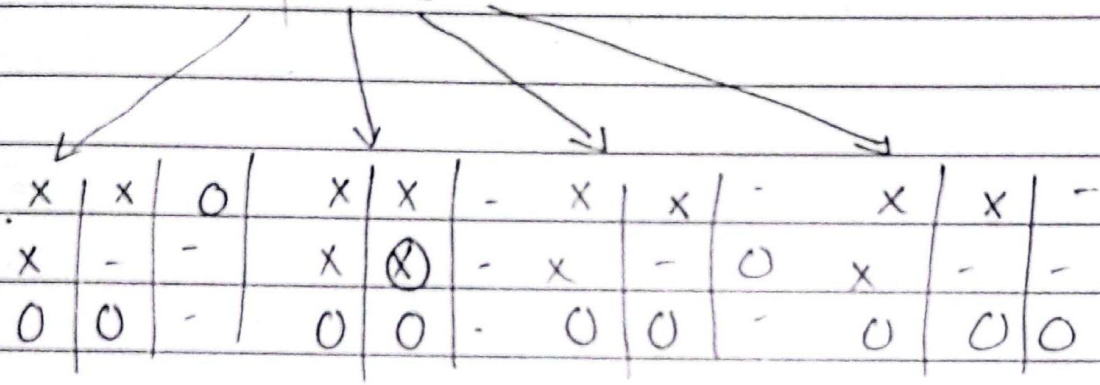
Question # 4 :

Config 1

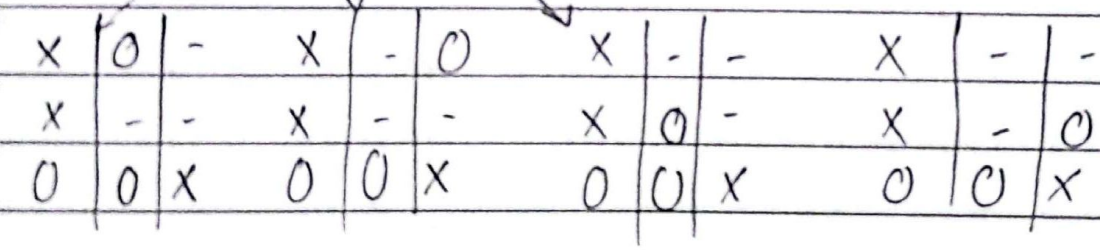
X	X	-
X	-	-
O	O	-



X	X	O		X	X	-		X	X	-		X	X	-
X	-	-		X	⊗	-		X	-	O		X	-	-
O	O	-		O	O	-		O	O	-		O	O	O

Config 5

X		
X		
O	O	X



X	O	-		X	-	O		X	-	-		X	-	-
X	-	-		X	-	-		X	O	-		X	-	O
O	O	X		O	O	X		O	O	X		O	O	X

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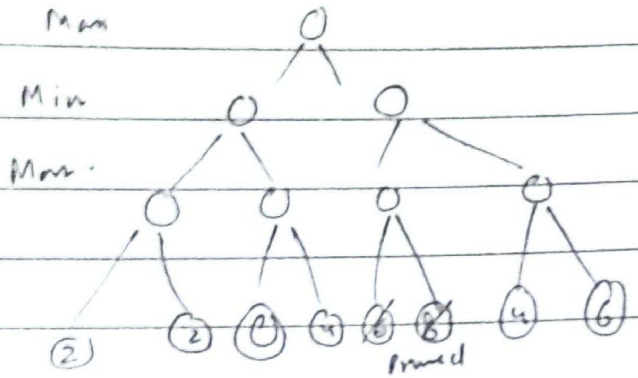
Question 5

A:



Max Choses the Right Child (Value 4)

Min Choose any child with Value 4

Path to first(4). Root -> Right Child -> First 4

Pruned branches, 8 4 6.

Root Value: 4

B:

Pruned Nodes:-

Left branch: Third Child (8)

Right branch, Third, fourth, fifth child (0, 2, 2).

Winning Path: Root -> Left Child. -> Second Child (4).

Root Value 4

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Question #6:

Part (a):- Game Model:

1 Players:- Defender (Max, Maximize Security), Attacker (Min, minimize damage)

2. Decision Making:- Defender uses Minimax to maximize security against Attackers worst move. Attackers minimize defenders security.

3: Stochastic Elements. force Defender to use expected values, balance Resources.

Part (b):- Tree. BF = Bruteforce, PA = Phishing, ZE = Zeroday, FA = False, RA = Real.