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Artificial Intelligence

Professor Cicirello

Homework 11

1. Cycle Crossover for the following permutations (random position to start is 4, assuming 0-based indexing):

Parent 1: A B C D E F G H I J K L M N O P

Parent 2: I C P H B O F J D K A N L G M E

Child 1: A C P D B F G H I J K L M N O E

Child 2: I B C H E O F J D K A N L G M P

2. Order Crossover (random cross‐sites, 0‐based indexes, between indexes 2 and 3, and between 7 and 8):

Parent 1: A B C | D E F G H | I J K L M N O P

Parent 2: I C H | P B O L J | D K A N F G M E

Queue 1: A C D E F G H I K M N

Queue 2: I C P B O L J K A N M

Child 1: K M N| P B O L J | A C D E F G H I

Child 2: A N M| D E F G H | I C P B O L J K

3. Non‐Wrapping Order Crossover (random cross‐sites, 0‐based indexes, between indexes 2 and 3, and between 7 and 8):

Parent 1: A B C | D E F G H | I J K L M N O P

Parent 2: I C H | P B O L J | D K A N F G M E

Queue 1: A C D E F G H I K M N

Queue 2: I C P B O L J K A N M

Child 1: A C D | P B O L J | E F G H I K M N

Child 2: I C P | D E F G H | B O L J K A N M

4. Partially Matched Crossover (random cross‐sites, 0‐based indexes, between indexes 2 and 3, and between 7 and 8):

Parent 1: A B C | D E F G H | I J K L M N O P

Parent 2: I C H | P B O L J | D K A N F G M E

Step 1

Child 1: A B C P E F G H I J K L M N O D

Child 2: I C H D B O L J P K A N F G M E

Step 2

Child 1: A E C P B F G H I J K L M N O D

Child 2: I C H D E O L J P K A N F G M B

Step 3

Child 1: A E C P B O G H I J K L M N F D

Child 2: I C H D E F L J P K A N O G M B

Step 4

Child 1: A E C P B O L H I J K G M N F D

Child 2: I C H D E F G J P K A N O L M B

Step 5

Solution

Child 1: A E C P B O L J I H K G M N F D

Child 2: I C J D E F G H P K A N O L M B

5. (\* (+ 2 x ) (/ (‐ x (\* (sqrt (\* 2 (\* x x))) z )) 5 ))

\* → + → 2

→ x

\* → / → 5

→ - → x

→ \* → z

→ sqrt → \* → 2

→ \* → x

→ x

6. (+ (\* x (if‐then‐else (> 5 y) 14 (/ z 6))) (‐ y (\* 2 (sqrt 5))))

+ → \* → x

→ if then else → > → 5

→ y

→ 14

→ / → z

→ 6

+ → - → y

→ \* → 2

→ sqrt → 5

7.

