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Course: Data Structures (CSE CS203A)

Assignment III: Linked List Selection Sort

Student Worksheet Companion

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A1. Linked List Representation Drawing (5 pts)

a. (2 pts) Instructions: Draw a visual representation of a single node with next pointer that contains the initialized integer 10

[10|•]→null

b. (3 pts) Linked list representation with the given integers (Hint: For safety and clarity, include identifiable head and tail nodes)

Example: the input integers are (10, 20) and linked list representation will be [10 | •] → [20 | •] →

head

↓

[60|•]→[24|•]→[15|•]→[42|•]→[20|•]→[11|•]→[90|•]→[8|•]← tail

Null.

A2. Populate with Integers (32 pts; 2 pts for each)

Fill the given integers (60, 24, 15, 42, 20, 11, 90, 8) into the above structures.

Annotate:

Node #	Value	Next Pointer
1	[60]	→ Node [2]
2	[24]	→ Node [3]
3	[15]	→ Node [4]
4	[42]	→ Node [5]
5	[20]	→ Node [6]
6	[11]	→ Node [7]
7	[90]	→ Node [8]

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8 [8] → [null]

A3. Selection Sort – First Three Steps (45 pts; 15 pts for each step)

Step Trace Table (Linked list):

Step 1 is the example to help you to complete step 2 to 4.

Step 1 (i = head = 60): Traverse list to find minimum value 8 → call swap function Yes; swap (60, 8).

head → [8|•] → [24|•] → [15|•] → [42|•] → [20|•] → [11|•] → [90|•] → [60|NULL]

Step 2 (i = 24): Minimum value [11] → call swap function (Yes) / No; swap ([24], [11]).

head → [8|•] → [11 |•] → [15 |•] → [42 |•] → [20 |•] → [24 |•] → [90 |•] → [60 |NULL]

Step 3 (i = 15): Minimum value [15] → call swap function Yes / (No) swap ([___], [___]).

head → [8|•] → [11 |•] → [15 |•] → [42 |•] → [20 |•] → [24 |•] → [90 |•] → [60 |NULL]

Step 4 (i = 42): Minimum value [20] → call swap function (Yes) / No; swap ([42], [20]).

head → [8|•] → [11 |•] → [15 |•] → [20 |•] → [42 |•] → [24 |•] → [90 |•] → [60 |NULL]

Student ID:

Student Name:

(1)	O(1)	(2)	O(n)
(3)	O(n)	(4)	O(n)
(5)	O(1)	(6)	O(1)
(7)	陣列已排序:O(1), 未排序:O(n)	(8)	O(n)
(9)	$O(n^2)$	(10)	$O(n^2)$
(11)	O(1)	(12)	
(13)	Low	(14)	Moderate

-2.

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Characteristics (54 pts, 3 pts for each)

Aspect	Array	Linked List
Storage	(1)	(2)
Access	(3)	(4)
Extra Variables	(5)	(6)
Traversal	(7)	(8)
Overhead	(9)	(10)
Visualization	(11)	(12)
Swaps	(13)	(14)
Flexibility	(15)	(16)
Overall	(17)	(18)

(1)

連續記憶體空間

(2)

使用不連續記憶體空間(結點)，以指標相連

(3)

用索引直接存取，時間複雜度O(1)

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(4)

需逐結點遍歷(循序)，時間複雜度O(n)

(5)

只存資料變數

(6)

每個節點要額外儲存next指標

(7)

速度較快，可使用索引依序存取

(8)

速度較慢，逐結點走訪

(9)

記憶體開銷小

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(10)

記憶體開銷大(指標與結點配置)

(11)

簡單

(12)

複雜，需畫節點和指標

(13)

直接用索引交換位置

(14)

交換節點中的資料值

(15)

大小固定

Student ID: Student Name:

(16)

可動態增加或刪除節點

(17)

適合進行排序

(18)

適合進行插入與刪除

8.