

Computer Science and Programming Lab Class 14

Task 1 *Max heap*(40min)

1. Implement a function **SinkDown(heap,item)** to do sink-down for the i-th element in the max-heap.
2. implement a function **heapify(list)** to transform a given list into a max-heap.
3. implement a function **heappush(heap,item)** to push the value (item) onto the heap, maintaining the heap invariant.
4. implement a function **heappop(heap)** to pop and return the largest item from the heap, maintaining the heap invariant.

Task 2 *Heapsort*(10min)

Implement the function **HeapSort(A)** to perform heap sort on a given list A.

Task 3 *Subset-sum problem*(25min)

Given a set of positive integers, implement a python programme find out all subsets which add up to a given number k. To be specific, you can test your code with [21,10,34,12,1,17,6] and k=22, and the result should be [21,1] and [20,12].

Task 4 *Queue with limited length*(10min)

Constructor for a LIFO queue with a maxsize. Maxsize is an integer that sets the upperbound limit on the number of items that can be placed in the queue. Insertion will overwrite the oldest element, once the maxsize is reached.

Task 5 *P=NP?*

Please prove that $P=NP$ or $P \neq NP$. If you can prove it correctly, then you can directly get a full mark in ICSP course!