Assignment 3 of ELEC 278

Due: Dec. 7, 2022, 11:59PM

Q1. Write DateSort() function that sorts an array of dates using quicksort method and main() function that reads an array of dates and outputs the sorted array of dates.

Example:
Input:

Date arr[] = {{20, 1, 2014}, {25, 3, 2010}, {3, 12, 1676}, {18, 11, 1982}, {19, 4, 2015},{ 9, 7, 2015}, {12, 8, 2010}, {30, 8, 2010}, {21, 1, 2014}, {20, 7, 2014}, {18, 11, 2020}}

Output:

Date arr[] = {{ 3, 12, 1676}, {18, 11, 1982}, {25, 3, 2010}, {12, 8, 2010}, {30, 8, 2010}, {20, 1, 2014}, {21, 1, 2014}, {20, 7, 2014}, {19, 4, 2015}, {9, 7, 2015}, {18, 11, 2020}}

Q2. Use hash table to implement a cache (a cache is a high-speed data storage layer which stores a subset of data, so that future requests for that data are served up faster than is possible by accessing the data's primary storage location).

- cache(int capacity): Initialize the a cache with positive size capacity.
- int get(int key): Return the value of the key if the key exists, otherwise return -1.
- void put(int key, int value): Update the value of the key if the key exists. Otherwise, add the key-value pair to the cache. If the number of keys exceeds the capacity from this operation, evict the least recently used key.
- void main(): implement the following example and output the cache.

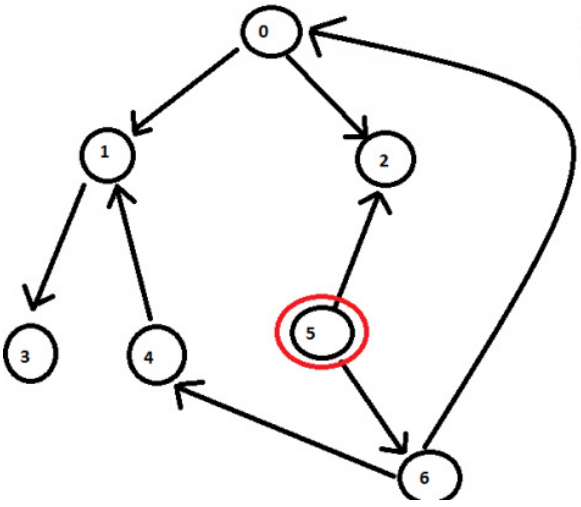
```
Cache(2);

put(1, 10); // it will store a key (1) with value 10 in the cache.

put(2, 20); // it will store a key (2) with value 20 in the cache.
```

```
get(1); // returns 10

put(3, 30); // evicts key 2 and store a key (3) with value 30 in
the cache.

get(2); // returns -1 (not found)

put(4, 40); // evicts key 1 and store a key (4) with value 40 in
the cache.

get(1); // returns -1 (not found)

get(3); // returns 30

get(4); // returns 40

put(5, 50); // it will store a key (5) with value 50 in the cache.
```

Q3. Write a function Mothvex() to find a mother vertex in the graph and main() function to create a graph, for example, the graph below, and output the mother vertex in that graph. If the mother vertex of the graph does not exist, output -1. If there are multiple mother vertex, output all of them.

A mother vertex in a graph G = (V, E) is a vertex v such that all other vertices in G can be reached by a path from v.

Example:



In this graph the mother vertex is- '5'(circled red) as we can reach any node from - '5' through a directed path

To reach 0-
5->6->0
To reach 1-
5->6->0->1
To reach 2-
5->2
To reach 3-
5->6->0->1->3
To reach 4-
5->6->4
To reach 6-
5->6