CSCI 3333 Practice Quiz HEAP2

Problem 1. Select the running times for each operation of a min heap.

The worst-case running time of \texttt{insert}. ■ \(\Theta(1)\) ■ \(\Theta(\log(n))\) ■ \(\Theta(n)\)

The worst-case running time of \texttt{pop}. ■ \(\Theta(1)\) ■ \(\Theta(\log(n))\) ■ \(\Theta(n)\)

The best-case running time of \texttt{pop}. ■ \(\Theta(1)\) ■ \(\Theta(\log(n))\) ■ \(\Theta(n)\)

The worst-case running time of \texttt{front}. ■ \(\Theta(1)\) ■ \(\Theta(\log(n))\) ■ \(\Theta(n)\)

Problem 2. Consider a min heap implemented with the following private variables:

\begin{verbatim}
private:
    int* H;       // Heap array
    int count;    // Number of elements in heap
    int capacity; // Length of H
\end{verbatim}

Complete the following implementation of a private min heap method that bubbles up an element at the given index.

\begin{verbatim}
void MinHeap :: bubble_up(int index)
{
    int cur = index;
    while (true)
    {
        if (cur == 0)
        {  
          \[ \]
          int parent = (cur-1)/2;
          if (H[parent] \[ \]
                  H[cur])
          {  
            swap(H[\[ ]], H[\[ ]]);
            cur = \[ ];
        }
    }
}
\end{verbatim}
Problem 3. Consider a min heap implemented with the following private variables:

```cpp
private:
  int* H;       // Heap array
  int count;    // Number of elements in heap
  int capacity; // Length of H
```

Complete the following implementation of a private min heap method that bubbles down the element at index 0, e.g. during pop.

```cpp
void MinHeap :: bubble_down()
{
  int cur = _____;
  while (true)
  {
    int lci = 2*cur + _____; // Left child index
    int rci = 2*cur + _____; // Right child index

    if (lci _____ count)
      break;
    else if (rci _____ count)
    {
      if (H[cur] _____ H[lci])
      {
        swap(H[cur], H[lci]);
        cur = _____;
      }
      else
        break;
    }
    else if (H[lci] _____ H[rci])
    {
      swap(H[cur], H[lci]);
      cur = _____;
    }
    else
    {
      swap(H[cur], H[rci]);
      cur = _____;
    }
  }
}
```