MST-Binomial-Heaps(G)
1. T ← ∅
2. for each $v_i \in V[G]$
3.  Heap-$V_i$ ← Make-Binomial-Heap()
4.  Insert(Heap-$V_i$, $v_i$)
5.  Heap-$E_i$ ← Make-Binomial-Heap()
6. for each $(v_i, v) \in E[G]$
7.  Insert(Heap-$E_i$, $(v_i, v)$)  // Use the weight of edge $(v_i, v)$ as the key field
    // in the Min-Binomial-Heap, and store the
    // vertices $v_i, v$ in the node.
8. while there is more than one set $V_i$
9.  do choose any set $V_i$
10.  m = Extract-Min(Heap-$E_i$)
11.  Let u and v be the two vertices stored in m
12.  $V_x = V_u$ and $V_y = V_v$
13.  while parent[$V_x$] ≠ NIL
14.    $V_x = \text{parent}[V_x]$
15.  while parent[$V_y$] ≠ NIL
16.    $V_y = \text{parent}[V_y]$
17.  if $V_x \neq V_y$
18.    T ← T ∪ {(u, v)}
19.    Heap-$V_x$ ← Union(Heap-$V_x$, Heap-$V_y$)
20.    Heap-$E_x$ ← Union(Heap-$E_x$, Heap-$E_y$)
21. return T

The entire for loop in lines 2-7 takes $O(E \cdot \lg |E|)$

Lines 3-5 take $O(1)$. Line 4 inserts a single vertex into the binomial tree in the binomial heap.

Lines 7 takes $O(\lg |E|)$ since each $E_i$ will have at most $|E|$ nodes, and it is executed $O(|E|)$ times. Therefore, the complexity of the entire loop in lines 2-7 is $O(E \cdot \lg |E|)$.

The while loop in lines 8-20 will be executed $O(|E|)$ times. Note: $\rightarrow$ indicates the complexity per line * the number of times the line is executed.

Line 10 takes $O(\lg |E|) \rightarrow O(E \cdot \lg |E|)$

Lines 13-14 take $O(\lg |V|) \rightarrow O(E \cdot \lg |V|)$
Lines 15-16 take $O(\lg |V|) \rightarrow O(E \cdot \lg |V|)$

These lines are used to find the representative element of the two nodes. The representative elements are then compared in line 17 to determine if nodes u and v are in the same binomial tree in the binomial heap.

By the if statement in line 17, lines 18-20 are executed $O(|V|)$ times because each Union will reduce the number of disjoint sets on Vertex by 1.

Line 18 takes $O(1) \rightarrow O(|V|)$
Line 19 takes $O(\lg |V|) \rightarrow O(V \cdot \lg |V|)$
Line 20 takes $O(\lg |E|) \rightarrow O(V \cdot \lg |E|)$

MST-Binomial-Heaps is $O(|E| \cdot \lg |E|)$. $E$ is bounded from below by $\Omega(V)$ because a connected graph has at least $|V| - 1$ edges and from above by $O(|V|^2)$ in the case of a completely connected graph.