國立高雄應用科技大學
101 學年度碩士班招生考試
資訊工程系

准考證號碼□□□□□□□□□□ （考生必須填寫）

資料結構

試題　共 4 頁，第 1 頁

注意：a. 本試題共 10 題，共 100 分。
b. 作答時不必抄題。
c. 考生作答前請詳閱答案卷之考生注意事項。

1. (5%) Convert the following expression into prefix form.
(D – A * B) + (A + C) * F

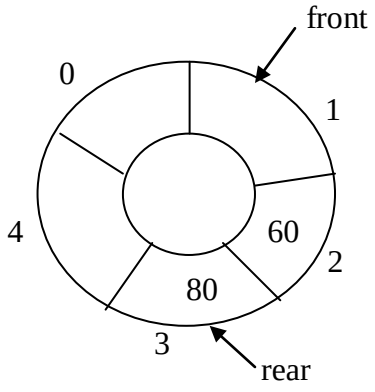
2. (10%)

```
void addq (char item) {
   rear = ( rear + 1 ) % 5;
   queue[ rear ] = item;
}
```

```
char deleteq( ) {
   front = (front + 1 ) % 5;
   return queue[ front ];
}
```

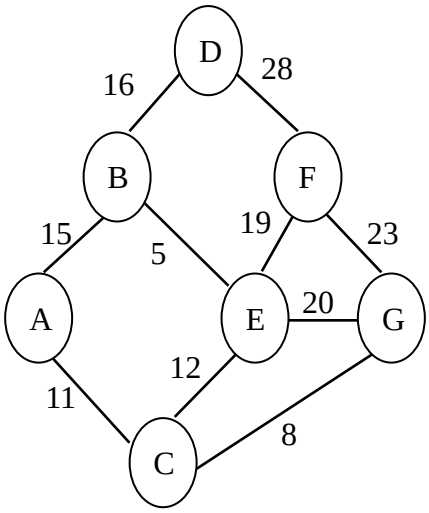
Assume the current content of the circular queue is as in the right figure. Assume for simplicity, the queue is never full or empty. Please update its content, along with the front and rear pointers, after each of the following 3 function calls. Your answer should have 3 diagrams.

addq(30);
deleteq( );
addq(50);



3. (10%) Draw the binary tree whose post-order sequence is D C E B I H G J F A and whose in-order sequence is C D B E A G H I F J.

4. (10%)
   a. (5%) Find the minimum-cost spanning tree of the following graph.
   b. (5%) Starting from node A and ignoring edge cost, find the breadth-first-search tree, or breadth-first-search sequence of the following graph.



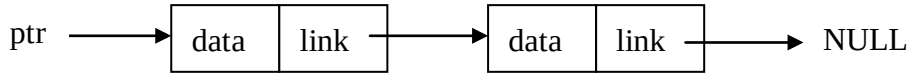
5. (15%) Recursive Depth-First-Search of an undirected graph.
   a. (10%) Complete the following recursive C function.

```
/* graph[5][5] is the adjacency matrix of an undirected graph G = (V, E).
   graph[v][w] = graph[w][v] = 1 if (v, w) ∈ E;
   graph[v][w] = graph[w][v] = 0 otherwise.
   The following is a depth first search of G beginning at v.
*/
visited[5] = {FALSE, FALSE, FALSE, FALSE, FALSE};
void dfs (int v) {
   int w;
   visited[ v] = TRUE;
   printf("%3d", v);

   for( w = 0 ; w < 5 ; w++)
      if(_____ && _____)
         dfs( w );
}
```

   b. (5%) In the above program, what data structure can be used to replace recursion? Briefly explain how by a diagram.

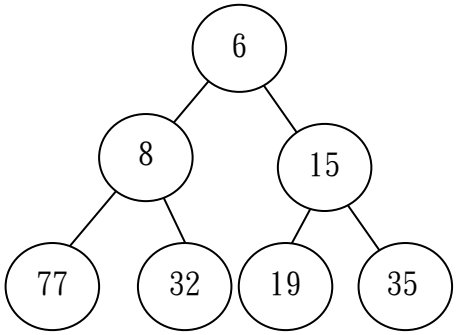
6. (10%) Assume the structure of the linked list is as follows:



Complete the following C function that returns the pointer to the last node.

```
node *(node *ptr){
        if( ptr == NULL )
              return NULL;
        for (_____; _____ ; _____){
           /* fill in proper codes, if any */
        }
        return ptr;
}
```

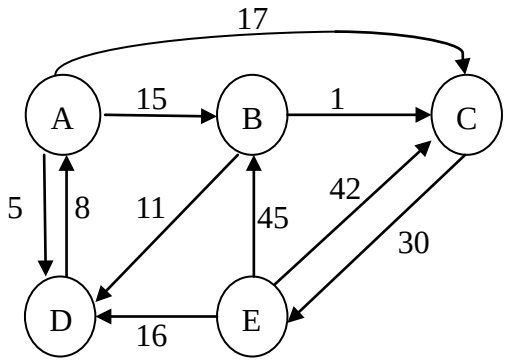
7. (10%)　Describe, in detail, the pop (or delete) process on the following min-heap. What is the return value?



8. (10%)　Describe, in detail, how to insert 1, 2, 3, 4, 5 into an empty balanced binary search tree. (You can pick either AVL tree or Red-Black tree).

9. (10%)　Given the following 8 keys: 33 20 65 7 98 14 83 71,
   a. (5%)　perform a quick sort step by step
   b. (5%)　perform a insertion sort step by step

10. (10%) Use the Dijkstra's algorithm to find all the shortest paths with node E being the source. The set S contains nodes to which shortest path is known, and distance[X] means the shortest distance to X through nodes in S.



Explain why node D is being picked into S after node E. And finish the following table.

S	distance[A]	distance[B]	distance[C]	distance[D]
{ E }	∞	45	42	16
{ E, D}	24			