編號： 197

國立成功大學 108 學年度碩士班招生考試試題

系　　所：製造資訊與系統研究所

考試科目：程式設計

考試日期：0223，節次：2

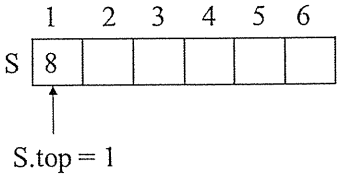
※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

I. Data Structures (55%)

"Stack", "Queue", "Linked List" and "Rooted tree" are simple data structures using pointer as dynamic sets.

1. (5%) Illustrate the result of each operation in the sequence PUSH(S,8), PUSH(S,3), PUSH(S,4), POP(S), PUSH(S,6) PUSH(S,2), and POP(S) on an initially empty stack S stored in array S[1..6]

   Ex:



   PUSH(S, 8) :

2. (10%) Explain how to implement two stack in one array A[1..n] in such a way that neither stack overflow unless the total number of elements in both stacks together is *n*.
3. (10%) Illustrate the result of each operation in the sequence ENQUEU(Q, 4), ENQUEU(Q, 1), ENQUEU(Q, 3), DENQUEU(Q), ENQUEU(Q, 8) and DENQUEU(Q) on an initially empty queue *Q* stored in array Q[1..6].
4. (10%) Show how to implement a queue by a single linked list.
5. (10%) Draw the binary tree rooted at index 6 that is represented by the following attributes:

index	key	Left	right
1	12	7	3
2	15	8	NIL
3	4	10	NIL
4	10	5	9
5	2	NIL	NIL
6	18	1	4
7	7	NIL	NIL
8	14	6	2
9	21	NIL	NIL
10	5	NIL	NIL

6. (10%) Write an O(n)-time recursive procedure that, given an *n*-node binary tree, prints out the key of each node in the tree.

II. Algorithm (45%)

7. (10%) (1) Given an undirected graph (Figure 1), use a queue to show the operation of breadth-first search. (5%) (2) Draw the breadth-first tree based on the result of (1).

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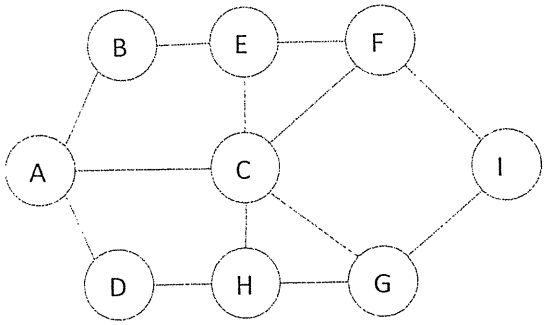

Figure 1 an undirected graph

8. (10%) (1) Given a directed graph (Figure 2), show the operation of depth-first search (DFS).
   (5%) (2) Draw the depth-first tree based on the result of (1).

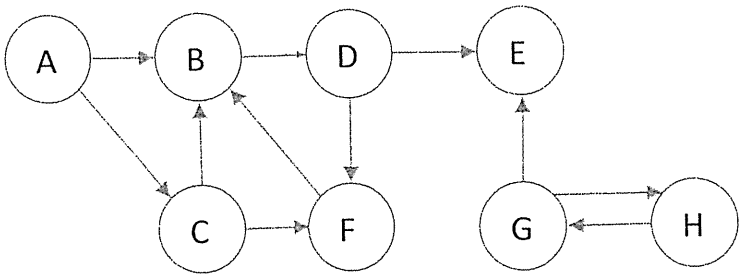

Figure 2 a directed graph

9. (5%) Show the shortest path tree rooted at s of graph G in Figure 3.

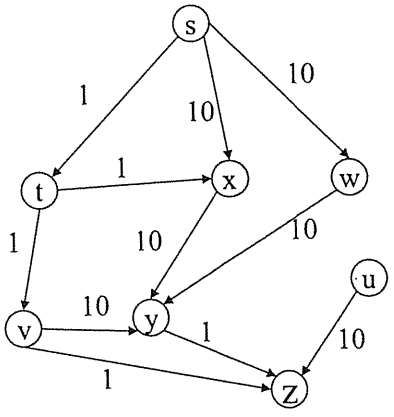

Figure 3 Graph G.

10. (10%) Take Figure 4 as an example, show how Dijkstra algorithm works.

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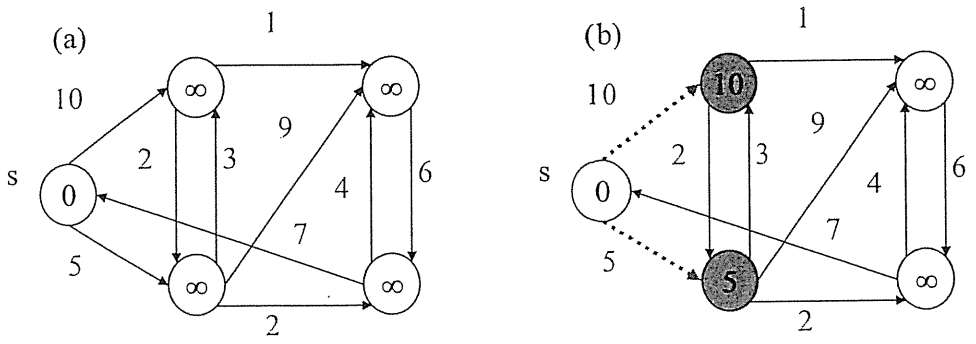

Figure 4