

CprE 185: Intro to Problem Solving (using C)
Midterm 2: Wednesday Oct 27, 2010

Student Name:

Student ID Number:

Lab Section (circle one): Tue 10-12, Tue 12-2, Tue 2-4, Tue 4-6, Wed 12-2

1. True/False Questions (10 x 1p each = 10p)

- (a) The compiler is always right. TRUE / FALSE
- (b) The C compiler automatically initializes all array elements TRUE / FALSE
- (c) The sizeof() operator returns the size of an array TRUE / FALSE
- (d) The increment clause of a do loop is optional TRUE / FALSE
- (e) This code will cause a compile error: `int a[10]; a[-1]=5;` TRUE / FALSE
- (f) The default clause in switch is not optional TRUE / FALSE
- (g) A loop that has a break clause cannot be infinite TRUE / FALSE
- (h) break can be used with for loops but not with while loops TRUE / FALSE
- (i) A linear algorithm is faster than one running in log(N) time TRUE / FALSE
- (j) `if(to_be || !to_be)` TRUE / FALSE

2. Code Snippet (10 points)

Write a short code snippet (5-7 lines of C code) that reverses the order of the entries in the integer array a of size N. In other words, the first entry becomes the last. The last becomes the first. The second becomes the last but one. And so on.

3. Short answers (5 x 2p each = 10p)

(a) What is the meaning of this: `while((a[i]==b[i]) && a[i]) i++;` ?

(b) What is an algorithm?

(c) What is the difference between `&a[0]` and `a`?

(d) What is a sentinel?

(e) What is the meaning of: `for(i=0, j=N; a[i]==b[j]; i++, j--) ;` ?

4. Rewriting Code (3 x 5pt each = 15pt).

a) Rewrite the do loop as a for loop (5pt).

```
int n;  
do  
{  
    printf("Enter a number: ");  
    scanf("%d", &n);  
} while(n<0);
```

b) Rewrite the following using if-else (5pt).

```
c = (a==b) ? i++ : j--;
```

c) Rewrite with a switch statement (5pt)

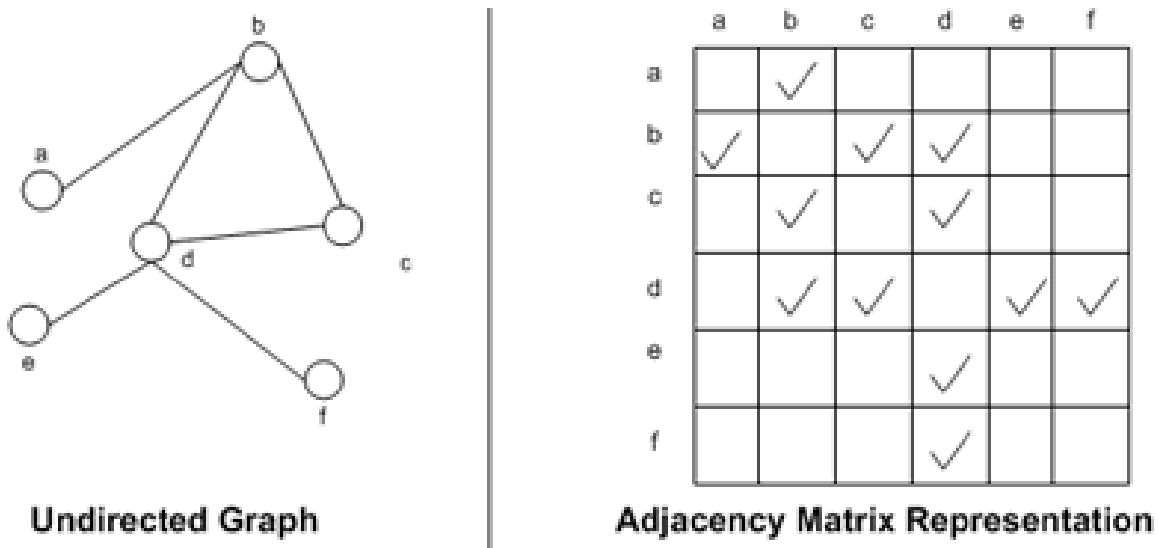
```
if(c==1) i++;  
else if (c>2 && c<=5) j++;  
else if (c>5 && c<7 || c==9) k++;  
else l++;
```

5. Social Network (2 x 10 pt = 20 points)

Social network websites like Facebook try to capture the social connections between individuals in terms of “friendship” links. People with more friends have more links to other people, and thus, are more highly connected.

One way to model a social network is with a data structure called an undirected graph. Each person is represented with a node in the graph. A friendship relationship is represented with an edge between the nodes corresponding to the two individuals. The graph itself can be represented with an adjacency matrix, which is a square table with an entry for each friendship relationship. In fact, there are two entries for each relationship because the edges of the graph are undirected, meaning that if c is a friend of d then d is also a friend of c.

The figure below shows a simple social network with 6 individuals (a, b,c,d,e, and f) and their friendship relationships expressed both as a graph and as an adjacency matrix.



Part A (10 points): Write a complete C program that uses the adjacency matrix defined above to print the number of friends that each individual has. You don't need to enter the network from the keyboard; it can be hardcoded in the code. Format the output as:

Person a has 1 friends.
Person b has 3 friends.
....

Part B (10 points): In addition to the output from part A, print only the top 3 most socially connected individuals and the number of friend for each (in decreasing order).

Question	Max	Score
True/False	10	
Code Snippet	10	
Short Answers	10	
Rewriting Code	15	
Social Network (A)	10	
Social Network (B)	10	
Program 1 (lab)	10	
Program 2 (lab)	15	
Program 3 (lab)	15	
Program 4 (lab)	15	
Program 5 (lab)	15	
TOTAL:	135	

May the source be with you!