Q.1   a. Differentiate between %f and %g format specifier with suitable example.

Answer: See the syntax of printf statement in C.

b. Can we implement recursion without using the concept of backtracking? Justify your answer.

Answer: Define backtracking and it is general concept for searching multiple path from a point one after the other. Backtracking is normally required in recursion however there exists many recursive algorithm without backtracking.

c. Write a method to store an arbitrarily large integer in memory.

Answer: Use linked list representation and store most significant 3 or 4 digits in the node pointed to by head significant digits in the node at the tail.

e. What is buddy system and where is it used?

Answer: Refer to Memory management part of the text book.

g. Differentiate between adjacency matrix and incidence matrix representations of graphs.

Answer: Graph representation (Data structure) from books.

Q.2   a. Write an iterative function in C to delete a desired node from a list. Can a recursive function be written for the same?

Answer: See linked list part in the book by either Tenenbaum or Sahani.

b. Write an algorithm to find the second largest value from an array without sorting it.

Answer:
L=a[1]
SL= a[2]
if (L< SL)
Swap L and SL
for i = 3 to n
{
    if (a[i] > L)
    {
        SL = L
        L = a[i]
    }
    else if (a[i] > SL)
        SL = a[i]

}
print L and SL

Q.3   **a. Explain 03 different ways of representing polynomials in the memory of a computer. Represent the following polynomials using your techniques:**

    (i) $2x^{100} + 8x + 15$

    (ii) $8x^3 - 15x^2 + 2x + 25$

    Using your representations, write an algorithm to add two polynomials.

Answer:

(i)

8	3	-15	2	2	1	25	0

(ii)

8	-15	2	25

(iii)

8	-15	2	25
3	2	1	0

Note: In method (ii), only Coefficients are stored in the descending order of the degree of terms. Therefore polynomial $8x^5 - 3x^3 + 10x$ will have to represented as follows.

8	0	-3	0	10	0

Q.4   **a. Adopting the technique used in Quick Sort algorithm to place a key value in its proper position, write an algorithm to find the Kth largest element from an array without sorting it.**

Answer: Using the technique employed in Quick Sort, if the first key value in an array was placed at the 12th location, 12th largest value is this key value. This technique can be repeatedly used in one of the snllist to find the desired Kth largest value**.**

    b. Read the following recursive function and give the output of func(5). Trace the way you have arrived at your result.

func (x)
{
 if (x == 1) return 9;
else if (x == 2) return 11;
else return (func (x – 1) + func(x – 2));
      }

 Answer: Outputs are 9, 11, 20, 31, 51……….; Show the tracing as well.

Q.6   **a.** **Explain Max-Flow Min-Cut algorithm in the context of network flow problem. What is the application of this technique? Explain your answer with a suitable example.**

Answer: Refer to graph algorithm explained in the book of "Horowitz and Sahani".

          b. **What is minimum spanning tree? Write Prim's algorithm to find the minimum spanning tree of a weighted undirected graph. Modify the algorithm to find the second minimum spanning tree of a graph.**

Answer: Refer to graph algorithm explained in the book of "Horowitz and Sahani".

Text Books

1. B. W. Kernighan and D.M. Ritchie, "The C Programming Language", Prentice Hall of India, 1989.

2. E. Horowitz, S. Sahai and S Anderson, "Fundamentals of Data Structures in C" Silicon Press, 2007.