

1. (a). What is the purpose of a stack in implementing a recursive procedure ? (5%)
 (b). Draw a stack description of the recursive process for a decimal number 184 and radix = 6. (5%)
 (c). Write a recursive function to convert decimal integers to their radix r representation by successive divisions. (10%)

2. (a). How to represent a term of polynomial in the variables x, y, z with node data structures. (5%)
 (b). What is the representation of the polynomial as a linked list.

$$3x^2 - 4xy + 5y^2 - xz \quad (5\%)$$
 (c). Formulate an algorithm which inserts a term of a polynomial into a linked list from the front. (10%)

3. (a). Explain binary tree and sort tree. (5%)
 (b). How to construct a sort tree for the following data:
 36, 71, 16, 27, 92, 13, 11, 46, 24, 85 (5%)
 (c). Suppose a node structure with

KEY	LP	RP
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 where LP and RP are the left pointer and the right pointer respectively, write an algorithm SEARCH (T, QUERY, X, E) to seek the key with a given key which is stored in QUERY.
 T is the base address of the root of the sort tree
 X is the return address of the record with KEY equal to QUERY
 E is an error flag, E = 1 (Not found), E = 0 (Found). (10%)

4. For a digraph G: $\textcircled{1} \rightarrow \textcircled{2} \rightarrow \textcircled{3} \rightarrow \textcircled{4} \rightarrow \textcircled{5}$
 (a). What is the set of edges E(G) ? What are the indegree and outdegree of each vertex ? (4%)
 (b). What is the adjacency matrix A ? (4%)
 (c). What is the transitive closure matrix A^+ ? (4%)
 (d). What is the reflexive transitive closure matrix A^* ? (4%)
 (e). What is the adjacency list representation ? (4%)

5. Explain the following terms:
 (a). Fibonacci buddy system (5%)
 (b). Data independence (5%)
 (c). Hash addressing collision resolution techniques (5%)
 (d). Optimum directory look up (5%)