USN | | | | | | | | | | |

10CS35

Third Semester B.E. Degree Examination, June/July 2018
Data Structures with C

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO full questions from each part.***

PART – A

1 a. Define the pointer variable and with syntax explain pointer declaration. Explain four memory management functions used in dynamic memory allocation in C. **(06 Marks)**

b. What is a recursive function? Give a recursive binary search program. **(04 Marks)**

c. Define three asymptotic notations and state whether following statements are true or false:
i) $3n^2 + 5 \in O(n)$ ii) $3n^2 + 5 \in \Omega(n)$ iii) $3n^3 + 5 \in O(n^3)$.
Give the method of computing asymptotic complexity for matrix addition by forming asymptotic table similar to step count table. **(10 Marks)**

2 a. Define structures and unions. With examples bring out the deferences between them. **(04 Marks)**

b. With suitable example, explain representation of sparse polynomial and give C representation to store sparse polynomial. Give C function to add two sparse polynomials. **(10 Marks)**

c. With an example show sparse matrix representation and explain in brief how would you get its transpose matrix. **(06 Marks)**

3 a. With necessary primitive functions explain how would you construct stack using dynamic arrays. **(06 Marks)**

b. Define a queue data structure. What is a circular queue? Show its implementation using array. **(04 Marks)**

c. Convert following infix expressions to postfix expression:
i) A $ B * C – D + E / F / (G + H) ii) (A + B) * (C′ - D).
How would you evaluate the postfix expression 6 2/3 + 42 * + using proper evaluating algorithms, show traces of the evaluation process. **(06 Marks)**

d. Explain how would you implement multiple stacks in a single array. **(04 Marks)**

4 a. What is a linked list? With necessary C functions explain linked list as data structure. **(06 Marks)**

b. With suitable example how can you add two polynomials using circular list representation of polynomials? Give C functions to perform addition of 2 polynomials using the same representation. **(10 Marks)**

c. Give C functions to perform the following:
i) Reversing or inverting a singly linked list
ii) Concatinating two circular lists. **(04 Marks)**

PART – B

5 a. Define the following terms referring to tree:
i) Binary tree
ii) Full binary tree
iii) Threaded binary tree
iv) Ancestors of node. **(04 Marks)**

b. Write the algorithms with recursive C functions to perform inorder, and preorder traversals for a given binary tree. Write the expression tree for given traversals inorder: A + B * C – D, preorder: * + AB – CD and find the given infix expression of that tree. **(08 Marks)**

c. What is a max heap? Construct a max heap for the given items 15, 10, 14, 2, 5, 20. Explain how would you add item with value 21 to that heap. Show the deletion of all nodes from that heap one by one resulting in a sorted list. **(08 Marks)**

6 a. What is a binary search tree? Construct binary search tree for the list 9, 14, 22, 20, 12, 7, 21 with C function show inserting an item whose value is 13 to that binary search tree. **(06 Marks)**

b. What is a graph? Represent graph shown in Fig.Q.6(b) using adjacency matrix and adjacency list representations. Explain in brief procedure used in the representations. **(06 Marks)**

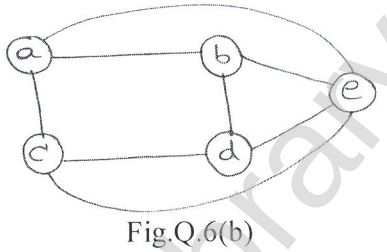

Fig.Q.6(b)

c. With examples explain the following:
i) Representation of disjoint sets ii) Winner tree. **(08 Marks)**

7 a. Define a priority queue. State two types of priority queues and explain the operations supported on a collection of elements by that priority queues. **(06 Marks)**

b. What is a leftist tree? For the leftist trees shown in Fig.Q.7(b)(i) and Fig.Q.7(b)(ii), explain how would you perform melding operation. Also show the results of operation pictorially, with necessary comments. **(06 Marks)**

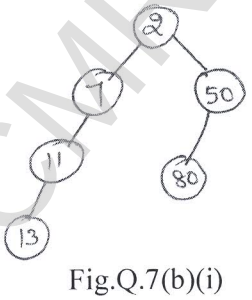

Fig.Q.7(b)(i)

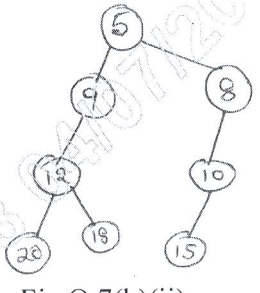

Fig.Q.7(b)(ii)

c. Define fibonnaci heap. Explain the following operations supported by this data structure with suitable example.
i) Deletion from an F-heap ii) Decrease key. **(08 Marks)**

8 Describe the following with examples:
i) AVL tree with its four rotation types to keep tree balanced. **(10 Marks)**
ii) Red-black trees-its properties and different types of rotations used. **(10 Marks)**

* * * * *