**List of Assignments**

**Data Structure Lab**

**Class: S.E. (Computer) SEM II (2018-19) Examination Scheme:**

**Practical Exam: 50 Marks**

**TW: 25 Marks**

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| **Group A** | |
| 1 | In Second year Computer Engineering class of M students, set A of students play cricket and set B of students play badminton. Write C/C++ program to find and display- Set of students who play either cricket or badminton or both  ii. Set of students who play both cricket and badminton  iii. Set of students who play only cricket  iv. Set of students who play only badminton  v. Number of students who play neither cricket nor badminton  (Note- While realizing the set duplicate entries are to avoided) |
| 2. | Write C/C++ program to store marks scored for first test of subject 'Data Structures and  Algorithms' for N students. Compute  I. The average score of class  ii. Highest score and lowest score of class  iii. Marks scored by most of the students  iv. list of students who were absent for the test |
| 3. | Write C/C++ program for storing matrix. Write functions for  a) Check whether given matrix is upper triangular or not  b) Compute summation of diagonal elements  c) Compute transpose of matrix  d) Add, subtract and multiply two matrices |
| 4. | An m x n matrix is said to have a saddle point if some entry a[i][j] is the smallest value in  row i and the largest value in j. Write C/ C++ function that determines the location of a  saddle point if one exists |
| 5. | **A magazine committee is to be formed that consists of any 3 members to be selected from{ Nikhita, Aboli, Megha, Sanika, Pratik, Saurabh}. Write C/C++ program to list all possible committees** |
|  | **A magic square is an n \* n matrix of the integers 1 to n2 such that the sum of each row, column, and diagonal is the same. The figure given below is an example of magic square for case n=5. In this example, the common sum is 65. Write C/C++ Program for magic square** |
|  | **Write C++ program with class for String. Write a function**  ** frequency that determines the frequency of occurrence of particular character in the**  **string.**  ** delete that accepts two integers, start and length. The function computes a new string**  **that is equivalent to the original string, except that length characters being at start have**  **been removed.**  ** chardelete that accepts a character c. The function returns the string with all occurrences of c removed.**  ** replace to make an in-place replacement of a substring w of a string by the string x. note that w may not be of same size of x**  ** palindrome to check whether given string is palindrome or not** |
| 6. | Write C++ program for sparse matrix realization and operations on it- Transpose, Fast  Transpose and addition of two matrices |
| **GROUP ‘B’** | |
| 7. | Department of Computer Engineering has student's club named 'Pinnacle Club'. Students of  Second, third and final year of department can be granted membership on request. Similarly  one may cancel the membership of club. First node is reserved for president of club and last  node is reserved for secretary of club. Write C++ program to maintain club member‘s  information using singly linked list. Store student PRN and Name. Write functions to  a) Add and delete the members as well as president or even secretary.  b) Compute total number of members of club  c) Display members  d) Display list in reverse order using recursion  e) Two linked lists exists for two divisions. Concatenate two lists |
| 8. | The ticket booking system of Cinemax theater has to be implemented using C++ program.  There are 10 rows and 7 seats in each row. Doubly circular linked list has to be maintained  to keep track of free seats at rows. Assume some random booking to start with. Use array to store pointers (Head pointer) to each row. On demand  a) The list of available seats is to be displayed  b) The seats are to be booked  c) The booking can be cancelled. |
| 9. | **Write C++ program for storing binary number using doubly linked lists. Write functions**  **a) to compute 1‘s and 2‘s complement**  **b) add two binary numbers** |
|  | **Design a linked allocation system to represent and manipulate univariate polynomials with integer coefficients (use circular linked lists with head nodes). Each term of the polynomial will be represented as a node Thus. a node in this system will have three data members as below:**    **To erase polynomials efficiently, we need to use an available-space list and associated**  **functions. The external (i.e.. for input or output) representation of a univariate polynomial will be assumed to be a sequence of integers of the form: n, c1, e1 ,c2. e2. c3. e 3 . . , cn en where ei represents an exponent and ci a coefficient; n gives the number of terms in the polynomial. The exponents are in decreasing order — i.e., e1> e2> …. >en.**  **Write and test the following functions:**  **1. istream&operator >>(istream& is, Polynomial& x): Read in an input polynomial**  **and convert it to its circular list representation using a head node.**  **2. ostream&operator<< (ostream&os, Polynomial& x): Convert x from its linked list**  **representation to its external representation and output it.**  **3. Polynomial:: Polynomial(const Polynomial& a) [Copy Constructor]: Initialize the**  **polynomial \*this to the polynomial a.**  **4. const Polynomial& Polynomial :: operator=(const Polynomial& a) [Assignment**  **Operator]: Assign polynomial a to\*this.**  **5. Polynomial:: Polynomial ( ) [Destructor]: Return all nodes of the polynomial \*this**  **to the available-space list.**  **6. Polynomial operator+ (const Polynomial& a, const Polynomial& b) [Addition]:**  **Create and return the polynomial a + b. a and b are to be left unaltered.**  **7. Polynomial operator\* (constPolynomial& a, constPolynomial& b) [Multiplication]:**  **Create and return the polynomial a \* b. a and b are to be left unaltered.**  **8. floatPolynomial ::Evaluate(float x): Evaluate the polynomial \*this at x and return the**  **result.** |
|  | **Write C++ program to realize Set using Generalized Liked List (GLL) e.g A ={ a, b, {c, d,e,{}, {f,g}, h, I, {j,k}, l, m}. Store and print as set notation.** |
| **Group C** | |
| 10. | Implement C++ program for expression conversion as infix to postfix and its evaluation  using stack based on given conditions  i. Operands and operator, both must be single character.  ii. Input Postfix expression must be in a desired format.  iii. Only '+', '-', '\*' and '/ ' operators are expected.. |
| 11. | Implement C++ program for expression conversiona) infix to prefix, b)prefix to postfix,  c) prefix to infix, d) postfix to infix and e) postfix to prefix. |
| 12. | A classic problem that can be solved by backtracking is called the Eight Queens problem,  which comes from the game of chess. The chess board consist of 64 square arranged in an 8 by 8 grid. The board normally alternates between black and white square, but this is not relevant for the present problem. The queen can move as far as she wants in any direction, as long as she follows a straight line, Vertically, horizontally, or diagonally. Write C++ program with recursive function for generating all possible configurations for 4-queen's problem. |
| 13. | **In any language program mostly syntax error occurs due to unbalancing delimiter such as (),{},[]. Write C++ program using stack to check whether given expression is well**  **parenthesized or not** |
|  | **A palindrome is a string of character that‘s the same forward and backward. Typically,**  **punctuation, capitalization, and spaces are ignored. For example, ‖Poor Dan is in a droop‖ is a palindrome, as can be seen by examining the characters ―poor danisina droop‖ and observing that they are the same forward and backward. One way to check for a palindrome is to reverse the characters in the string and then compare with them the original-in a palindrome, the sequence will be identical. Write C++ program with functions-**  **1. to check whether given string is palindrome or not that uses a stack to determine**  **whether a string is a palindrome.**  **2. to remove spaces and punctuation in string, convert all the Characters to lowercase,**  **and then call above Palindrome checking function to check for a palindrome**  **3. to print string in reverse order using stack** |
| **Group D** | |
| 14. | Queues are frequently used in computer programming, and a typical example is the creation of a job queue by an operating system. If the operating system does not use priorities, then the jobs are processed in the order they enter the system. Write C++ program for simulating job queue. Write functions to add job and delete job from queue. |
| 15. | Write program to implement a priority queue in C++ using an inorder List to store the items in the queue. Create a class that includes the data items(which should be template) and the priority (which should be int)The inorder list should contain these objects ,with operator <= overloaded so that the items with highest priority appear at the beginning of the list (which will make it relatively easy to retrieve the highest item.) |
| 16. | **A double-ended queue(deque) is a linear list in which additions and deletions may be made at either end. Obtain a data representation mapping a deque into a one-dimensional array. Write C++ program to simulate deque with functions to add and delete elements from either end of the deque.** |
|  | **Pizza parlor accepting maximum M orders. Orders are served in first come first served**  **basis. Order once placed can not be cancelled. Write C++ program to simulate the system using circular queue using array.** |
| **Group E** | |
| 17. | a) Write C++ program to store roll numbers of student in array who attended training  program in random order. Write function for searching whether particular student  attended training program or not using linear search and sentinel search.  b) Write C++ program to store roll numbers of student array who attended training  program in sorted order. Write function for searching whether particular student  attended training program or not using binary search and Fibonacci search. |
| 18. | Write C++ program to store first year percentage of students in array. Write function for  sorting array of floating point numbers in ascending order using   1. Quick sort and display top five scores 2. Bubble Sort 3. Shell Sort 4. Insertion Sort 5. Bucket Sort 6. Radix Sort |
| **Group F** | |
| 19. | Mini Project  Speech Recognition algorithms  1 Hidden Markov models  2 Dynamic time warping (DTW)-based speech recognition  3 Neural networks  Deep feedforward and recurrent neural networks  4 End-to-end automatic speech recognition |