Question Paper Code: 41487

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2016

Fourth Semester

Electrical and Electronics Engineering

14UIT424 - DATA STRUCTURES AND ALGORITHMS

(Common to Electronics and Instrumentation Engineering and Instrumentation and Control Engineering)

(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The preprocessor directive #include is required if
    (a) Console output is used   (b) Console input is used
    (c) Both console input and output is used (d) None of the above

2. A class is
    (a) Data type   (b) Abstract data type
    (c) User defined data type   (d) All of these

3. The void type is used for
    (a) Returning the value   (b) Creating generic pointers
    (c) Creating functions   (d) A void error

4. The function used to read a character from a file that has been opened in read mode is _____
    (a) putc   (b) getc   (c) getchar   (d) putchar

5. The postfix form of $A*B+C/D$ is
    (a) $*AB/CD+$ (b) $AB*CD/+$ (c) $A*BC+/D$ (d) $ABCD+/*$

6. What kind of initialization needs to be done for an open-address hash table?
   (a) None.
   (b) The key at each array location must be initialized
   (c) The head pointer of each chain must be set to NULL
   (d) Both B and C must be carried out

7. A binary search tree is generated by inserting in order the following integers: 50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24. The number of nodes in the left sub-tree and right sub-tree of the root respectively is
   (a) (4,7)   (b (7,4)   (c) (8,3)   (d) (3,8)

8. Which algorithm is used for obtaining minimum spanning tree, were choosing the adjacent vertices of already selected vertices is not necessary
   (a) Prim's   (b) Kruskal
   (c) Dijikstra   (d) Topological sort

9. You have to sort a list L consisting of a sorted list followed by a few "random" elements. Which of the following sorting methods would be especially suitable for such a task?
   (a) Bubble sort   (b) Selection sort
   (c) Quick sort   (d) Insertion sort

10. The quick sort algorithm exploit _____ design technique
    (a) Greedy   (b) Dynamic programming
    (c) Divide and Conquer   (d) Backtracking

PART - B (5 x 2 = 10 Marks)

11. Write a C++ code to create an array of 10 integers dynamically.

12. Write a C++ program to open and close the file.

13. Show how will you represent polynomial in linked representation.

14. How many nodes will be there in a minimum spanning Tree, if it is derived from a graph of *n* nodes? Justify your answer with a pictorial representation only.

15. Compare and contrast greedy algorithm with dynamic programming.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Write a program to input 5 nos. in array A[ ] and 5 nos. in array B[] and merge the elements of the array alternately into a third array C[] of size 10 and display all the three arrays. So if

         A[ ] = {10, 20, 30, 40, 50} and

         B[ ] = {11, 22, 33, 44, 55} then

         Resulting array C[ ] = {10, 11, 20, 22, 30, 33, 40, 44, 50, 55}   (8)

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(ii) What is a constructor? List the different types of constructor. With a suitable program explain how the dynamic constructor reduces memory wastage while creating objects? (8)

Or

(b) (i) What is dynamic initialization of objects? Why is it needed? How is it accomplished in C++? Illustrate. (8)

(ii) Create a class vector that represents an integer array. Using friend function overload * operator to perform 3*m, where m is an object of the class vector. Test the class with suitable main function. Can we use member function to overload the * operator instead of friend function? Justify your answer. (8)

17. (a) (i) Assume that the test results of a batch of students are stored in three different classes, student, test and result. Write a program using multilevel inheritance to print the result of two students having two subject marks. (8)

(ii) Write a C ++ program to count and display the number of BLANK SPACES in an existing text file notes.txt. (8)

Or

(b) (i) When do we make a virtual function "pure"? What are the implications of making a function a pure virtual function? (8)

(ii) Implement a program which uses multiple catch statements to handle exceptions. (8)

18. (a) (i) Let P be a pointer to a singly linked list. Show how this list may be used as a stack. That is, write algorithms to push and pop elements. Specify the value of P when the stack is empty. (8)

(ii) Define Hashing. How do collisions happen during hashing? Explain the different techniques resolving of collision. (8)

Or

(b) (i) Illustrate the steps for converting an infix expression into a postfix expression for the following expression
$(a + b)*(c + d)/(e + f)$ ^ g. (8)

(ii) What is priority queue? Explain how priority queues can be implemented? Give the applications of priority queues. (8)

19. (a) (i) Insert the following sequence of elements into an AVL tree, starting with an empty tree: 10, 20, 15, 25, 30, 16, 18, and 19. Delete 30 in the resultant AVL tree. (8)

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(ii) Find the topological ordering for the following graph. (8)
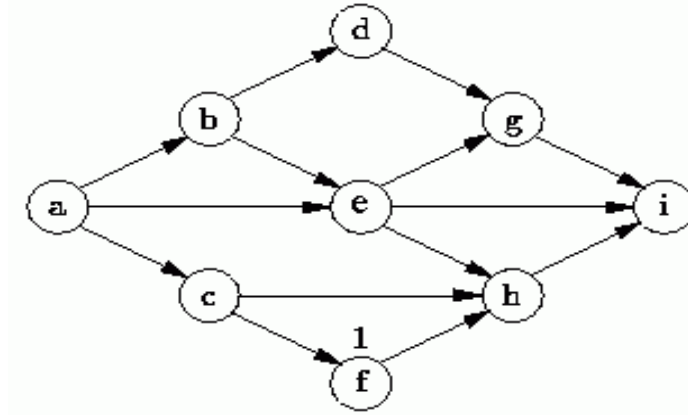
Or

(b) (i) What is a Binary Search Tree (BST)? Make a BST for the following sequence of numbers.

45, 36, 76, 23, 89, 115, 98, 39, 41, 56, 69, 48

Traverse the tree in Preorder, Inorder and Postorder. (8)

(ii) What is the difference between Prim's algorithm and Kruskal's algorithm for finding the minimum-spanning tree of a graph? Implement Prim's algorithms on the following graph. (8)
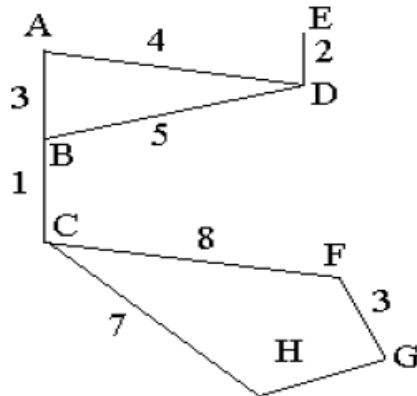
20. (a) (i) Show the various passes of bubble sort on an unsorted list 11, 15, 2, 13, 6. (6)

(ii) Sort the following list using heap sort 66, 33, 40, 20, 50, 88, 60, 11, 77, 30, 45, 65. (10)

Or

(b) (i) Sort the following sequence of keys using merge sort.
66, 77, 11, 88, 99, 22, 33, 44, 55 (8)

(ii) Write an algorithm to sort a given list using quick sort method. Describe the behaviour of quick sort when input is already sorted. (8)

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