

B.C.A. (THIRD SEMESTER) EXAMINATION, DECEMBER, 2020

Computer Applications

(Data Structures)

Paper- CS 211

Maximum Marks- 60

Attempt **Five** Questions in all, selecting **One** Question from each Unit. All question carries equal marks.

Unit I

Q1. (a) Define data structure and their types? Discuss the factors that affect the choice of particular data structure? Describe the various operations that can be performed on different data structures.

[2+2+2]

(b) Define algorithm complexity? Discuss the need of measuring the complexity of algorithm? Explain time-space trade off? Calculate the time complexity of Bubble selection and Insertion sort algorithm.

[1+1+1+3]

Q2. (a) Differentiate the following with example:

- (i) external sorting and internal sorting
- (ii) stable sort and unstable sort

[2+2]

(b) Sort the list 345, 437, 289, 673, 541, 89, 23, 148, 187 using:

- (i) Radix Sort in ascending order.
- (ii) Insertion sort in descending order.

Show the array after every pass/step (Dry run).

[4+4]

Unit II

Q3. (a) Convert the following infix expression in postfix and prefix expression using stack:

- (i) $((A + B) * C - (D - E) ^ (F + G))$
- (ii) $A + (B * C - (D / E \$ F) * G) * H$
- (iii) $((A + B) * D) \$ (E - F)$

NOTE: \$ IS USED FOR EXPONENTIATION

[2+2+2]

(b) Discuss overflow and underflow conditions when stack is implemented with array? What factors influence the choice of amount of memory for a given stack? Discuss one of the techniques to efficiently use the amount of memory reserved for stack?

[2+2+2]

Q4. (a) Suppose a queue is maintained by a circular array QUEUE with N=12 memory cells. Find the number of elements in QUEUE if (a) FRONT=4, REAR =8; (b) FRONT=10, REAR=3; and (c) FRONT= 5, REAR=6 and then two elements are deleted. [2+2+2]

(b) Differentiate the recursion and iteration? Draw the diagram to solve the tower of Hanoi problem for n=6 disks. [3+3]

Unit III

Q5. (a) Suppose A and B are sorted linked list with distinct elements, both maintained in INFO and LINK. Write a c procedure which combines the lists into a single sorted linked list C without changing any values in INFO. [6]

(b) "A two – way list is not much more useful than a one-way list except in special circumstances". Why it is so? Discuss those circumstances where they useful? [3+3]

Q6. Write the algorithm for the following procedure and find how many pointers need to be modified in the following operations?

- (i) Insert an element in the beginning of a linear linked list.
- (ii) Insert an element in the beginning of a doubly linked list.
- (iii) Insert an element in the middle of a doubly linked list.
- (iv) Delete an element from the end of a doubly linked list.
- (v) Delete an element from the middle of a doubly linked list.
- (vi) Delete an element from the middle of a linear linked list. [6*2]

Unit IV

Q7. (a) For a binary tree T, the pre-order and in-order traversal sequences are as follows:

Pre Order : A B E H Q R C D K L M

In Order: B Q R H E A D L K M C

- (i) Draw the binary tree
- (ii) What is the height of the tree?
- (iii) What are the internal nodes?
- (iv) What is its post order traversal sequence?
- (v) Show the content of stack for non-recursive pre order traversal in each step?
- (vi) Is the above drawn tree being complete binary tree? Justify your answer.

[1+1+1+1+3+2]

(b) Differentiate the full and complete binary tree? "All the full binary trees are complete binary trees but it does not hold good vice versa". Justify the statement with example? [1+2]

Q8. (a) Suppose the following eight numbers are inserted in order into an empty binary search tree T:

50,33,44,22,77,35,60,40

- (i) Draw the Tree T.

Draw the Tree T if each of the following operations is applied to the original tree T (That is operations are applied independently not successively.)

- (ii) Node 20 is added to T.
- (iii) Node 15 is added to T
- (iv) Node 88 is added to T.
- (v) Node 22 is deleted from T.
- (vi) Node 25 is deleted from T.
- (vii) Node 75 is deleted from T. [1*7]

(b) How an AVL tree differs from a Binary Search Tree? Construct the AVL Tree for the following sequence of data :16 ,27,9,11,36,54,81,63,72. [2+3]

Unit V

Q9. (a) Does the sequence <70,15,50,5,12,35,10> represent a max heap. Show the heap after the following operations:

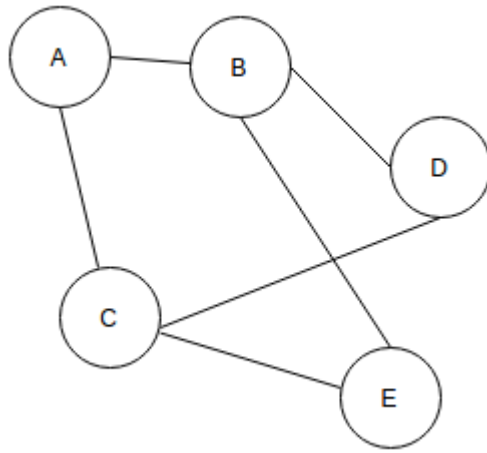
- (i) Insertion of element 25
 - (ii) Deletion from root
 - (iii) Insertion of element 75
- Also, give the number of exchanges performed in each case. [2+2+2]

(b) Given the following adjacency matrix:

0	4	0	2	0
0	0	0	7	0
0	5	0	0	0
0	0	0	0	3
0	0	1	0	0

- (i) Draw the weighted graph.
- (ii) Find the degree of each node.
- (iii) Find the degree of Graph.
- (iv) Find the indegree and out degree of each node.
- (v) Write the path matrix of Graph [1+1+1+1+2]

Q10. (a) Which data structure is used in BFS and DFS traversal of a graph. Give the BFS and DFS traversal for the following graph showing the content of data structure used, after each step.



[4+4]

(b) Explain the following terms in graph with example:

- (i) Connected node and Isolated node
- (ii) Graph and Multigraph
- (iii) Simple path and closed path
- (iv) Graph and Tree

[1*4]
