University of Sargodha

BS 3rd Term Examination 2020

Subject: Computer Science **Paper: Data Structure & Algorithms (CMP-3113)**

Time Allowed: 2:30 Hours **Maximum Marks: 80**

Note: Objective part is compulsory. Attempt any three questions from subjective part.

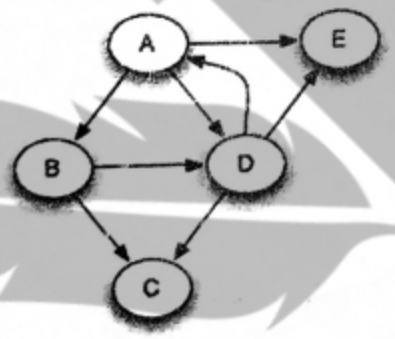
Objective Part (Compulsory)

Q.1. Write short answers of the following in 2-3 lines each on your answer sheet. (16*2)

i. Using C++ code, declare the structure of a node of doubly linked list?
ii. How many pointers (minimum) can be used to maintain a circular queue? And usually which node the pointer(s) points to?
iii. What is completely connected graph? Give an example in favour of your answer.
iv. What are the necessary conditions maintained while implementing recursion?
v. What do you mean by tail recursion?
vi. Which sorting algorithm usually gives better result? (Bubble sort or Insertion Sort)
vii. How many nodes are there in strictly binary tree when there are 5 leaves in the tree?
viii. Is it possible to draw a unique binary tree when only preorder or post order traversal has been given? Justify your answer?
ix. Write the name of two parameters that define a graph.
x. Which kinds of techniques are usually used to balance a binary tree?
xi. Which data structures are used for traversing a graph by two traversal algorithms.
xii. Which data structures is applied when dealing with a recursive function?
xiii. Why Dijkstra algorithm is used?
xiv. What is B-Tree?
xv. Why Hashing function is used?
xvi. Write the name of two kinds of complexities considered while implementing an algorithms?

Subjective Part (3*16)

Q.2. Traverse the following graph using DFS and BFS algorithms. Start with node A. [8+8]



Q.3. (a) Write down function to add a node as first node of doubly linked. The linked list may be empty at start. [08]

(b). write a function that deletes a node from a circular queue. Also consider the option that circular queue may having the only node to be deleted. [08]

Q.4. **(a):** Draw a **binary search tree** by inserting the following numbers from left to right.

10, 8, 13, 18, 2, 7, 21, 14, 9, 11, 3, 12, 5

(b) Traverse the tree by using following traversal techniques.

i.) Pre order traversal . **ii.** in-order traversal. **iii.** Post order traversal.

Delete the node 13 and then 10 and redraw the tree.

Q.5. (a):Write down the function for binary searching an element from an array recursively. [08]

(b) Write a function to calculate the 10th Fibonacci term by using tail recursion. [08]

Q.6. (a): Convert the following infix expression to postfix expression using stack. [08]

A + (((B – C) *(D - E) + F) / G) $ (H - J)

(b) Write a function that accepts two sorted arrays and merges them into third array (also passed from main function). [08]