137

DTE 2nd Semester

09 August 2018 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION — **SUMMER SEMESTER, 2017-2018**

DURATION: 1 Hour 30 Minutes — **FULL MARKS: 75**

CSE 4277: Data Structures and Algorithms

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

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1. a) Define data structures. What are the components of data structures. 5

   b) What are infix, postfix and prefix expressions? Write down the algorithm to convert infix expressions to postfix. 3+5

   c) Convert the following expressions into postfix: 12

      i. A + (B * C – (D / E^F) * G) * H

      ii. D / C + A * A / B * X - E * F / J

2. a) Evaluate the following Reverse-Polish expression using a stack: 8

      1 2 3 + 4 5 6 × – 7 × + – 8 9 × +

      Show the stack content at each iteration phase.

   b) Write down the algorithm for selection sort. Explain how performance of selection sort can be improved by using a heap instead of an array. Find the worst-case cost for both type of implementations. 13

   c) What is efficiency of an algorithm? Discuss the worst-case analysis of a Binary search. 4

3. a) Write down algorithms for the following functions of a singly liked list: 4+4+3

      i. Insert_in_position. [It inserts a node in a specific position].

      ii. Remove_from_position. [Removes a node from a specified position]

      iii. Insert_at_front. [It inserts new node at the front of the list].

   b) Write short notes of the following. Also mention some real-life applications of the data structures. 4+4

      i. Stack

      ii. Queue

   c) Write the sequence of steps required to perform enqueue operation on a queue. 6

4. a) Discuss the best, worst, and average case time complexity of an algorithm. Differentiate between Big-O and little o notations. 4+3

b) Consider the diagram below: 5

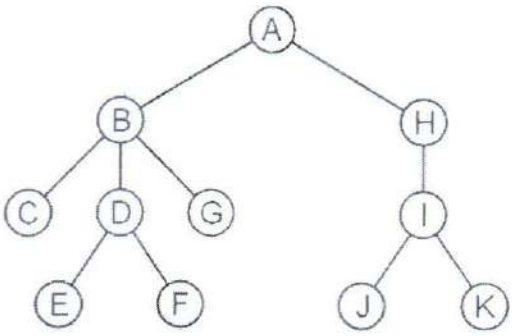
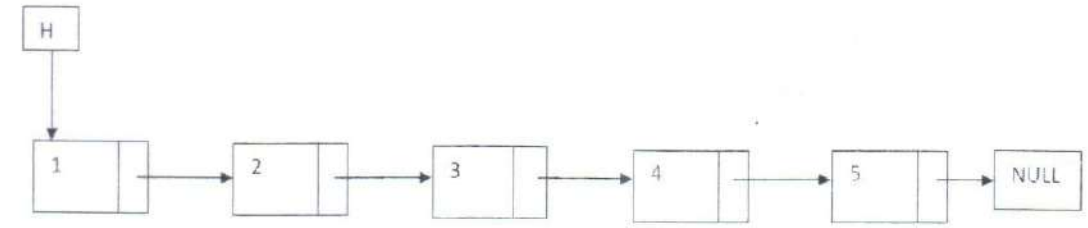


Figure 1: For Question 4.(b)

What is the preorder, inorder and post order traversal of this tree?

c) Create a singly linked list. Keep track of how many nodes are there. Take a position of node from the user. If it is greater than total number of nodes in the linked list show error message otherwise make that node the new head node and take all elements before it to the end of the linked list. See the following diagram for understanding. 13



Node Number: 4

Output should be as follows:

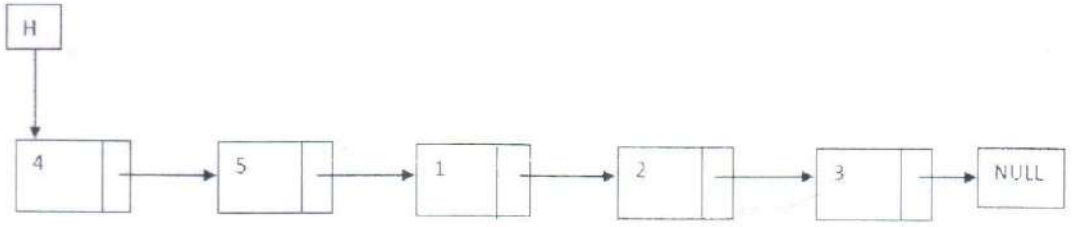


Figure 2: For Question 4.(c)