

**Birla Institute of Technology & Science, Pilani**  
**Work-Integrated Learning Programmes Division**  
**First Semester 2019-2020**  
**M.Tech (Data Science and Engineering)**  
**Mid-Semester Test (EC-2 Make Up)**

Course No. : DSECF ZG519  
Course Title : DATA STRUCTURE ALGORITHMS AND DESIGN  
Nature of Exam : Closed Book  
Weightage : 30%  
Duration : 90 Min  
Date of Exam : 06-07-2019[AN]

No. of Pages	= 2
No. of Questions	= 8

Note:

1. Please follow all the *Instructions to Candidates* given on the cover page of the answer book.
2. All parts of a question should be answered consecutively. Each answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

Answer All the Questions (Only in the pages mentioned against questions. If you need more pages. Continue remaining answers from page 17 onwards)

Question 1: [2M] [ to be answered only in page 2]

- 1) Explain why, when resolving hash-table collisions via linear probing, one cannot remove an entry from the hash table by resetting the slot to NIL.

Question 2: [2M] [ to be answered only in page 3]

- 2) What is the running time of depth-first search, as a function of  $|V|$  and  $|E|$ , if the input is represented by an adjacency matrix instead of an adjacency list?

Question 3: [4M] [ to be answered only in pages 4-5]

- 3) Consider an empty stack of integers. Let the numbers 1,2,3,4,5,6 be pushed on to this stack in the order they appear from left to right. Let S indicate a push and X indicate a pop operation. Can they be permuted in to the order 325641(output) and order 154623(output)?

Question 4: [4M] [ to be answered only in pages 6-7]

- 4) Find the complexity of the below recurrence:  $T(n) = \begin{cases} 2T(n/2) + n, & \text{if } n > 1 \\ 1 & \text{if } n = 1 \end{cases}$

Question 5: [5M] [ to be answered only in pages 8-10]

- 5) Convert the following infix expression to its equivalent postfix expression showing stack contents for the conversion:  $(A+B)*(C^{(D-E)+F})-G$

Question 6: [4M] [ to be answered only in pages 11-12]

- 6) Question based on Fig:1, Get the transitive closure of the relation represented by the digraph below. Use the Floyd-Warshall's algorithm. Indicate what arcs must be added

to this digraph to get the digraph of the transitive closure, and draw the digraph of the transitive closure.

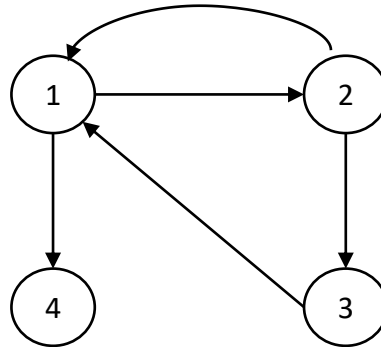


Fig-1

Question 7: [4M]

[ to be answered only in pages 13-15]

- 7) Question based on Fig:2. Calculate the page rank of the 6 web pages, using 4 iterations for the following graph. Assume the damping factor  $d = 0.8$  and initial page rank of each page is 1.

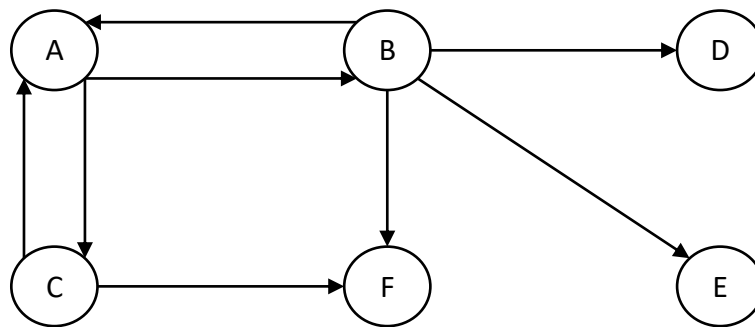


Fig-2

Question 8: [5M]

[ to be answered only in pages 15-16]

- 8) Explain how you can utilize a minimum heap to sort the list of number in descending order. Let  $n$  be the number of elements in the list. What is the complexity of your sorting algorithm.

\*\*\* ALL THE BEST \*\*\*