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| **paf_kiet_logo** | **COLLEGE OF COMPUTING AND INFORMATION SCIENCES** | | |
| **Mid-Term Assessment Fall 2020 Semester** | | |
| **Class Id** | 105067/105088 | **Course Title** | Data Structure |
| **Program** | BSCS | **Campus / Shift** | Main Campus / Weekend |
| **Date** | 23rd – October 2020 | **Total Marks** | 20 |
| **Duration** | 02 hours | **Faculty Name** | Muhammad Naveed |
| **Student Id** |  | **Student Name** |  |

**Instructions of online submission:**

* Filling out Student-ID and Student-Name on exam header is mandatory.
* Do not remove or change any part of exam header or question paper.
* Write down your answers in given space or at the end of exam paper with proper title

“Answer for Question#”.

* Answers should be formatted correctly (font size, alignment and etc.)
* Handwritten text or image should be on A4 size page with clear visibility of contents.
* Only PDF format is accepted (Student are advise to install necessary software)
* In case of CHEATING, COPIED material or any unfair means would result in negative

marking or ZERO.

* A mandatory recorded viva session will be conducted to ascertain the quality of answer

scripts where deemed necessary.

* **Caution:** Duration to perform Mid-Term Assessment is **02 hours only**. Extra 01 hours are given to cater all kinds of odds in submission of Answer-sheet. **Therefore, if you failed to upload answer sheet on LMS (in PDF format) within 03 hours limit, you would be considered as ABSENT/FAILED.**
* Attempt **ANY SEVEN(7)** questions. All questions carry equal marks.
* Answer all the questions in this question paper.
* Check carefully PDF document before uploading that it has all the answers provided by you with snapshots if you have in your paper.

**Q1.** Suppose an array BOOK that stores the database of books sold each year from 2000 to 2020. Base (BOOK] = 500 and W = 8 words per memory cell for BOOK. Show

**(a)** The complete memory representation pictorially and

**(b)** The address of the array element at the mentioned-below locations

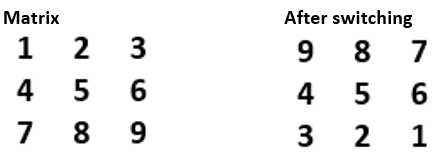
(i) LOC (BOOK[2010])

(ii) LOC (BOOK[2015])

**Q2.** Write an algorithm that compute MAX and MIN values found in a linear array in such a way that it consider only those indexes which occur at multiples of 3. For example first it checks 3rd index then 6th then 9th and so on.

**Q3.** Write an algorithm using a ***single loop*** to swap the values of primary diagonal with the values of secondary diagonal of a square matrix (a square matrix is a matrix that contains equal number of rows & columns). The user input will be an ***array*** and size ***N***.

***For example***, the program must switch the elements as shown:

****

Your algorithm should be generic.

**Q4.** You are given the following array:

ARRAY 🡺 10 20 30 40 50 60 70

In the above-mentioned array, which values indicating the best case, average case, and worst case. Also mention the total number of key comparisons required in each case if you are applying

1. Linear Search
2. Binary Search

**Q5.**

1. Write down the algorithm for searching in sorted linked list? At the end show total number of steps taken to search the required value? Also show the message for best case, average case and worst case if the value found at any respective case?
2. There are 3000 elements in an array, how many passes are required by bubble sort to sort the array? If the array is already sorted how many passes are required for 3000 elements? In the second last pass, how many comparisons are required?

**Q6.**

1. Insert Sajid in beginning of linked list, show all the changes required by linked list for this insertion.
2. In the updated linked list (means after inserting Sajid), delete Ibrahim from the linked list, show all the changes required by linked list for this deletion.
3. In the updated linked list, delete the last element from the linked list, show all the changes required by linked list for this deletion.
4. In the updated linked list, delete the first element from linked list

**Answer:**

|  |  |  |
| --- | --- | --- |
| **Add** | **BED** | **LINK** |
| 1 | Aslam | 7 |
| 2 |  | 6 |
| 3 | Danish | 11 |
| 4 | Asif | 12 |
| 5 | Iqbal | 3 |
| 6 |  | 0 |
| 7 | Sattar | 4 |
| 8 | Ibrahim | 1 |
| 9 | Akbar | 0 |
| 10 |  | 2 |
| 11 | Shahid | 8 |
| 12 | Ahmed | 9 |

|  |  |
| --- | --- |
| **START** | **5** |
| **AVAIL** | **10** |

1. **Change Beginning:**

|  |  |  |
| --- | --- | --- |
| **Add** | **BED** | **LINK** |
| 1 | Aslam | 7 |
| 2 |  | 6 |
| 3 | Danish | 11 |
| 4 | Asif | 12 |
| 5 | Iqbal | 3 |
| 6 |  | 0 |
| 7 | Sattar | 4 |
| 8 | Ibrahim | 1 |
| 9 | Akbar | 0 |
| 10 | Sajid | 2 |
| 11 | Shahid | 8 |
| 12 | Ahmed | 9 |

|  |  |
| --- | --- |
| **START** | **10** |
| **AVAIL** | **2** |

1. **Delete Ibrahim**:

|  |  |  |
| --- | --- | --- |
| **Add** | **BED** | **LINK** |
| 1 | Aslam | 7 |
| 2 |  | 6 |
| 3 | Danish | 11 |
| 4 | Asif | 12 |
| 5 | Iqbal | 3 |
| 6 |  | 0 |
| 7 | Sattar | 4 |
| 8 |  | 1 |
| 9 | Akbar | 0 |
| 10 |  | 2 |
| 11 | Shahid | 8 |
| 12 | Ahmed | 9 |

|  |  |
| --- | --- |
| **START** | **10** |
| **AVAIL** | **8** |

1. **Delete Last Element:**

|  |  |  |
| --- | --- | --- |
| **Add** | **BED** | **LINK** |
| 1 | Aslam | 7 |
| 2 |  | 6 |
| 3 | Danish | 11 |
| 4 | Asif | 12 |
| 5 | Iqbal | 3 |
| 6 |  | 0 |
| 7 | Sattar | 4 |
| 8 | Ibrahim | 1 |
| 9 | Akbar | 0 |
| 10 |  | 2 |
| 11 | Shahid | 8 |
| 12 |  | 9 |

|  |  |
| --- | --- |
| **START** | **10** |
| **AVAIL** | **12** |

1. **Delete First Element:**

|  |  |  |
| --- | --- | --- |
| **Add** | **BED** | **LINK** |
| 1 |  | 7 |
| 2 |  | 6 |
| 3 | Danish | 11 |
| 4 | Asif | 12 |
| 5 | Iqbal | 3 |
| 6 |  | 0 |
| 7 | Sattar | 4 |
| 8 |  | 1 |
| 9 | Akbar | 0 |
| 10 |  | 2 |
| 11 | Shahid | 8 |
| 12 |  | 9 |

|  |  |
| --- | --- |
| **START** | **10** |
| **AVAIL** | **1** |

**Q7.**

1. Explain what is the aim of mentioned-below code
2. Compute the total running time and time complexity of the following code.

Array input[m][n][p]

Array output[m][n]

for i = 1 to m

for j = 1 to n

for k = 1 to p

sum = sum + input[i][j][k]

[end for k]

Output[i][j] = sum

Sum=0

[end for j]

[end for i]

**Q8.** Consider the following 2-D array

|  |  |  |  |
| --- | --- | --- | --- |
| 5 | 10 | 15 | 20 |
| 25 | 30 | 35 | 40 |
| 45 | 50 | 55 | 60 |

1. Show the memory representation of this 2-D array in Row major order and Column major order
2. If starting address of this 2-D array is 1000, then what would be the memory address at 2nd Row and 3rd Column using Row major order having the word size 4.