CS302-Design and Analysis of Algorithm

Monday, June 2, 2020

Course Instructor

Mr. Adeel Ashraf Cheema
Mr. Muhammad Haris
Mr. Shoaib Saleem

Serial No:

2nd Mid Term Exam
Spring Semester 2020
Max Time: 3 Hour
Max Marks: 60
Exam Weight (Out of 100). 10

Name:	Hassan Ashas	Roll No:	18F-0128	Section:	D

General Instructions:

1. There are Four (4) Questions in total.
2. Questions reading and understanding are also part of the exam, only answer what is asked.
3. Read the questions carefully for clarity of context and understanding of meaning and make assumptions wherever required, for neither the invigilator will address your queries, nor the teacher/examiner will respond to any of your queries.

Guidelines for Submission:

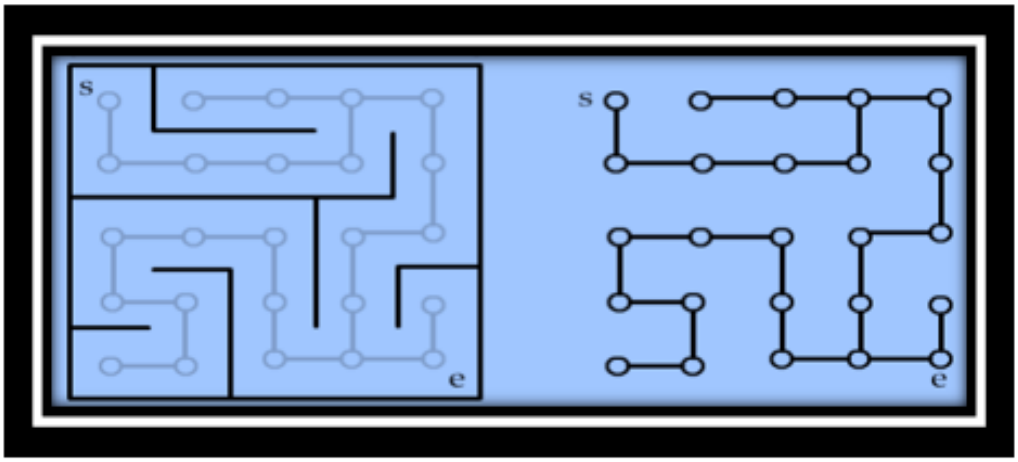
1. You must solve/attempt it on paper in your handwriting on paper and take the picture of that solution and insert it in provided docx file. The image can be pasted inside that document under the appropriate question.
2. You should submit only one PDF answer sheet file Containing All four questions Answers Images.
3. You can change the attached Docx file and add your questions answer images into it and submit it.
4. Naming Convention of file must be followed.
5. Example:
    a. Rollnumber_Section.pdf
    b. 18f0123_C.pdf
6. You must submit your answer sheet before due time in Assignment Section via **Slate** http://203.124.42.218:8080/portal.
7. Submissions submitted after the due time shall not be considered.
8. If you don't finish every part of a question, don't worry! You can still submit what you've done to get marks based on your efforts.
9. **In case of copied or plagiarized solutions in exam Or If a student provided help to another student during exam both will be awarded "F" grade and it will affect the student CGPA.**
10. Viva of any student can be conducted by the instructor after conducting an online exam in case of any doubt.
11. The answer sheet should be submitted through **Slate** http://203.124.42.218:8080/portal. **But in the worst case, you can email it to your class teacher within the deadline.**

Guidelines for attempting:

1. Your answer sheet (Every Image File) must contain your Full name, Roll number and Section and Cleary written in top of the page and must be in readable form.
2. Handwriting must be readable.
3. Proper explain the steps.
4. Answer without steps or explanation (Direct Calculated answer) will get ZERO marks.

	Q-1	Q-2	Q-3	Q-4	Total
Total Marks	20	5	15	20	60
Marks Obtained					

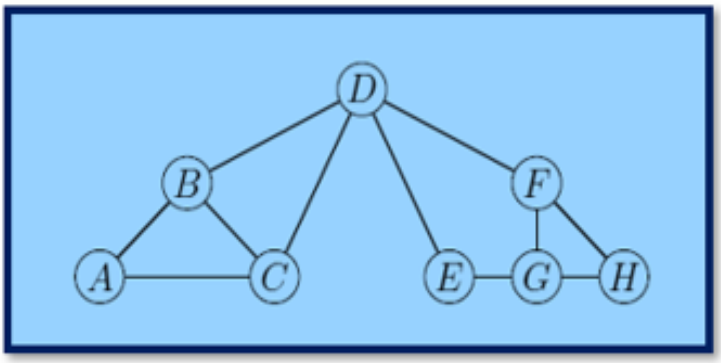
Question 1: **Marks = 20**



A maze can be viewed as a graph, if we consider each juncture (intersection) in the maze to be a vertex, and we add edges to the graph between adjacent junctures that are not blocked by a wall. Please study the picture above until you understand how a maze can be converted into a graph. Our mazes will always have a starting point at the upper left corner and an ending point at the lower right corner.

Consider the following graph as a result of conversion from any maze.

a. Find the Traversal path using Breadth First Search Algorithm from A vertex to H vertex. Show complete steps.
b. Find the Traversal path using Depth First Search Algorithm from A vertex to H vertex. Show complete steps.



Question 1: Solution: Upload Image of your work here

Q1. BFS

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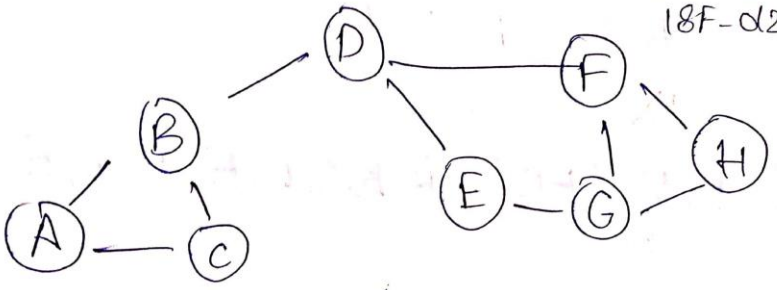

Queue : A | B | C
Path : A

Queue : B | C | D
Path : A, B

Queue : C | D
Path : A, B, C

Queue : D | E | F
Path : A, B, C, D

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Queue : E | F | G
Path : A, B, C, D, E

Queue : F | G | H
Path : A, B, C, D, E, F

Queue : G | H
Path : A, B, C, D, E, F, G

Queue : H

Final Path (BFS): A, B, C, D, E, F, G, H

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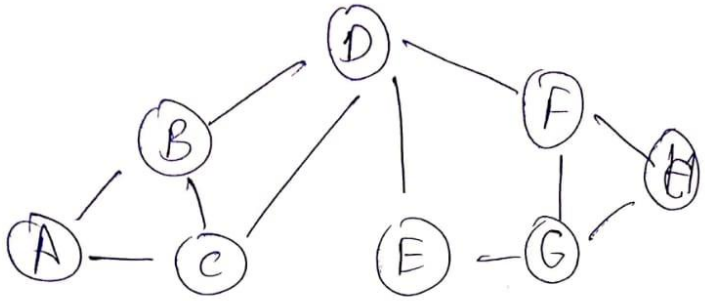
Q1. DFS



Stack: A B C

Path : A

Stack: B G

Path : A , C

Stack: B D

Path : A, C, D

Stack: B F E

Path : A, C, D, E

Stack: B F G

Path : A, C, D, E, G

Stack : B F H

Final Path (DFS): A, C, D, E, G, H
(A to H)

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Question 2:	Marks = 5

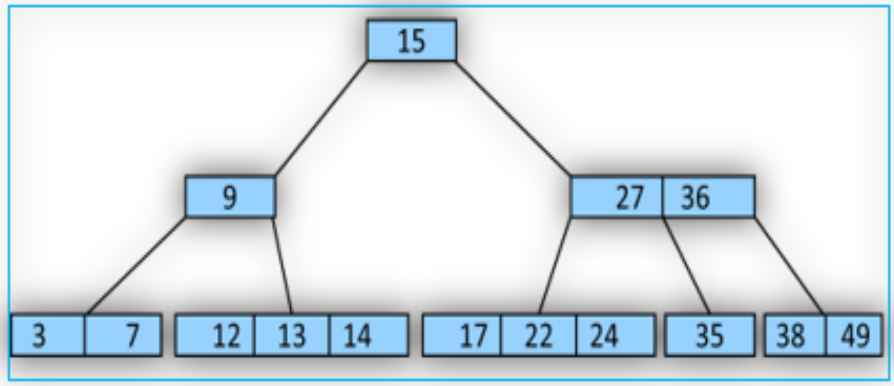
Write a pseudo code that will return all records with a search key greater than or equal to k1 and less or equal to k2 in B-Tree. Give the analysis of your code in term of Big O.

Question 2: Solution: Upload Image of your work here

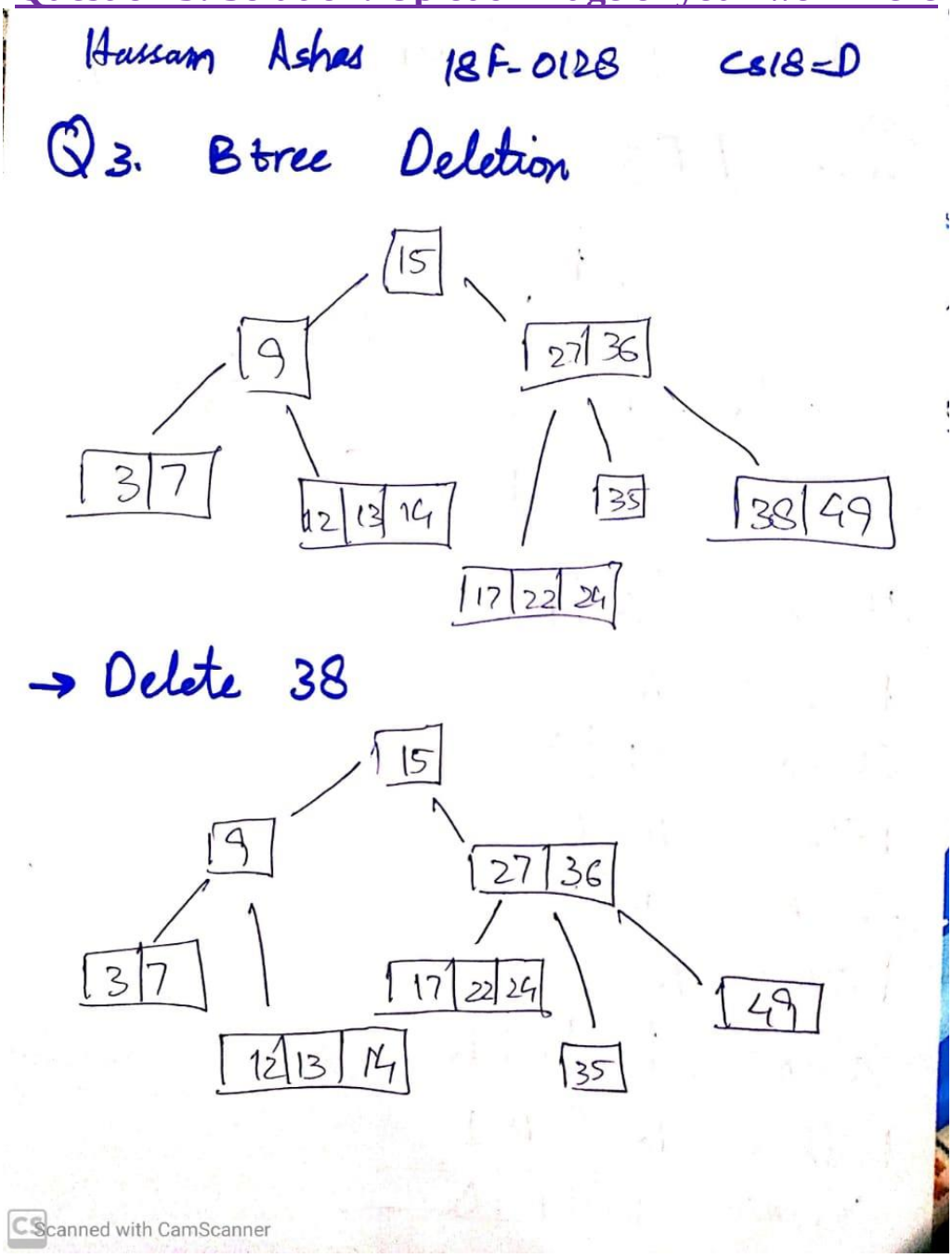
Didn’t Attempt.

Question 3:	Marks = 15

Delete the following keys **38, 35, 17, 22, 36 and 27** in same order from the following B-tree. You must show each step after each deletion. **Assume M=4.**



Question 3: Solution: Upload Image of your work here



→ Delete 35

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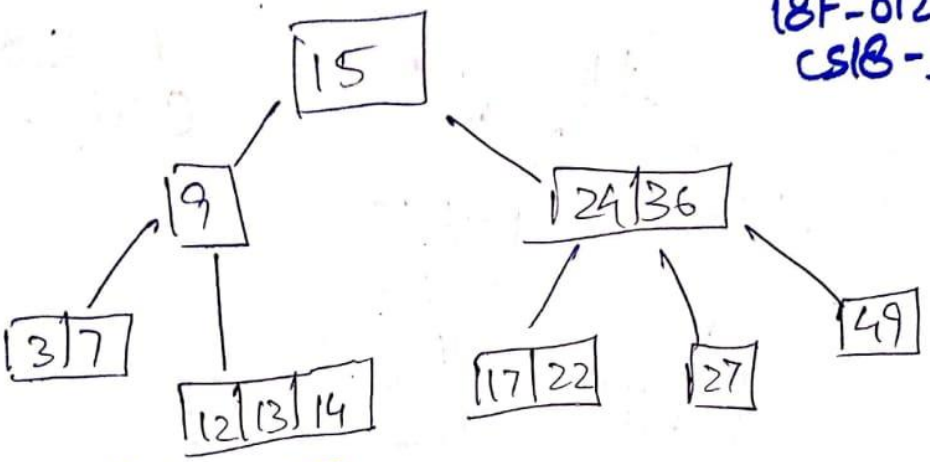
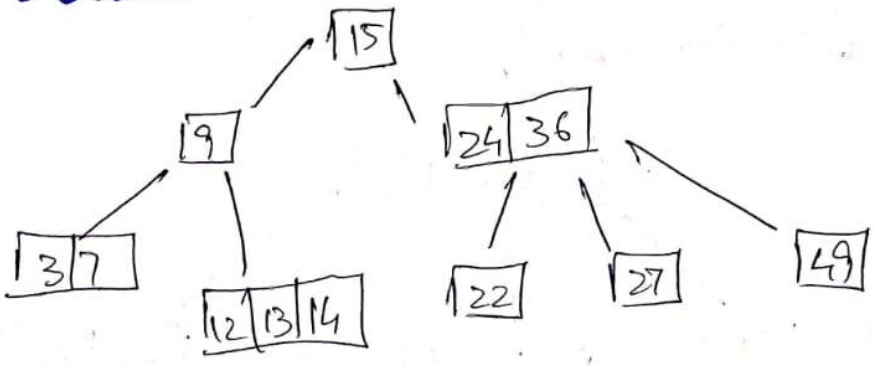
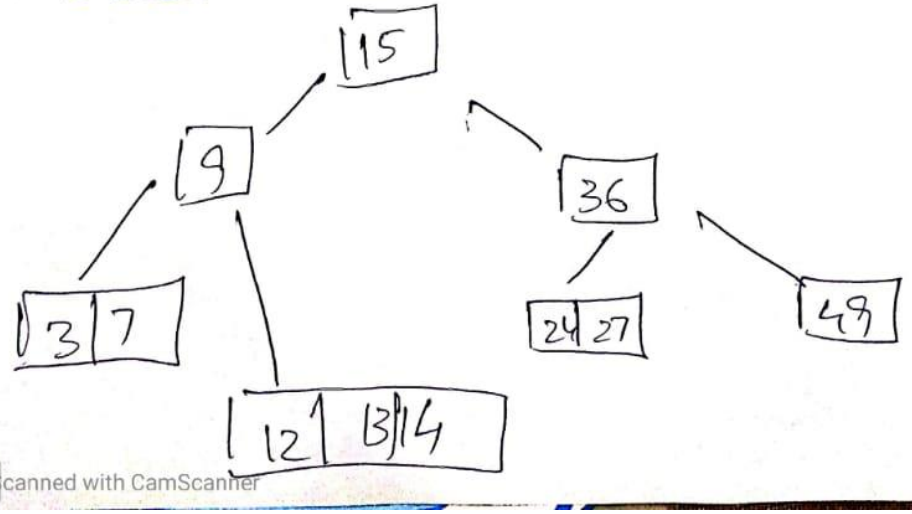


→ Delete 17



→ Delete 22



→ Delete 36

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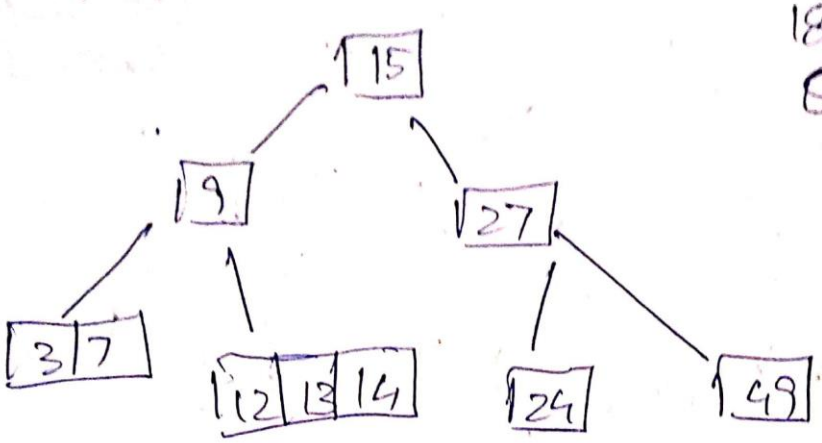
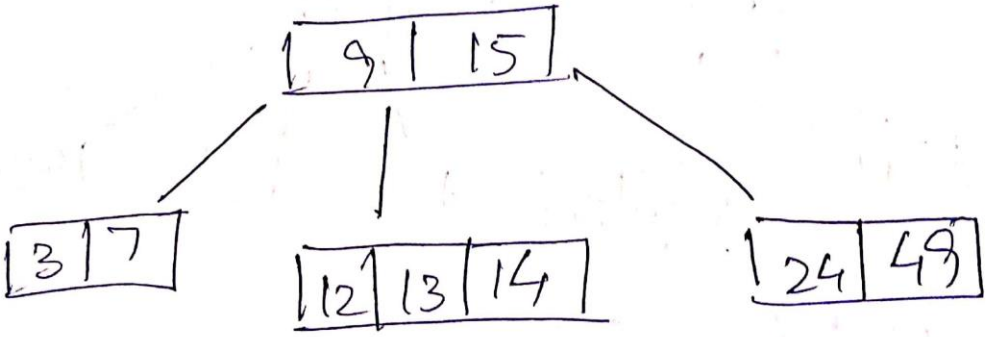


→ Delete 27



Question 4: **Marks = 20**

Knuth-Morris-Pratt matching algorithm use PREFIX function to calculate the prefix table. Your task is to complete the prefix table (given below) for pattern "ababacaababaca" using the algorithm below. Also calculate the total number of times "While" loop written in line 5 executes.

Show complete steps, Direct answer will not be accepted. Three steps are solved for you.

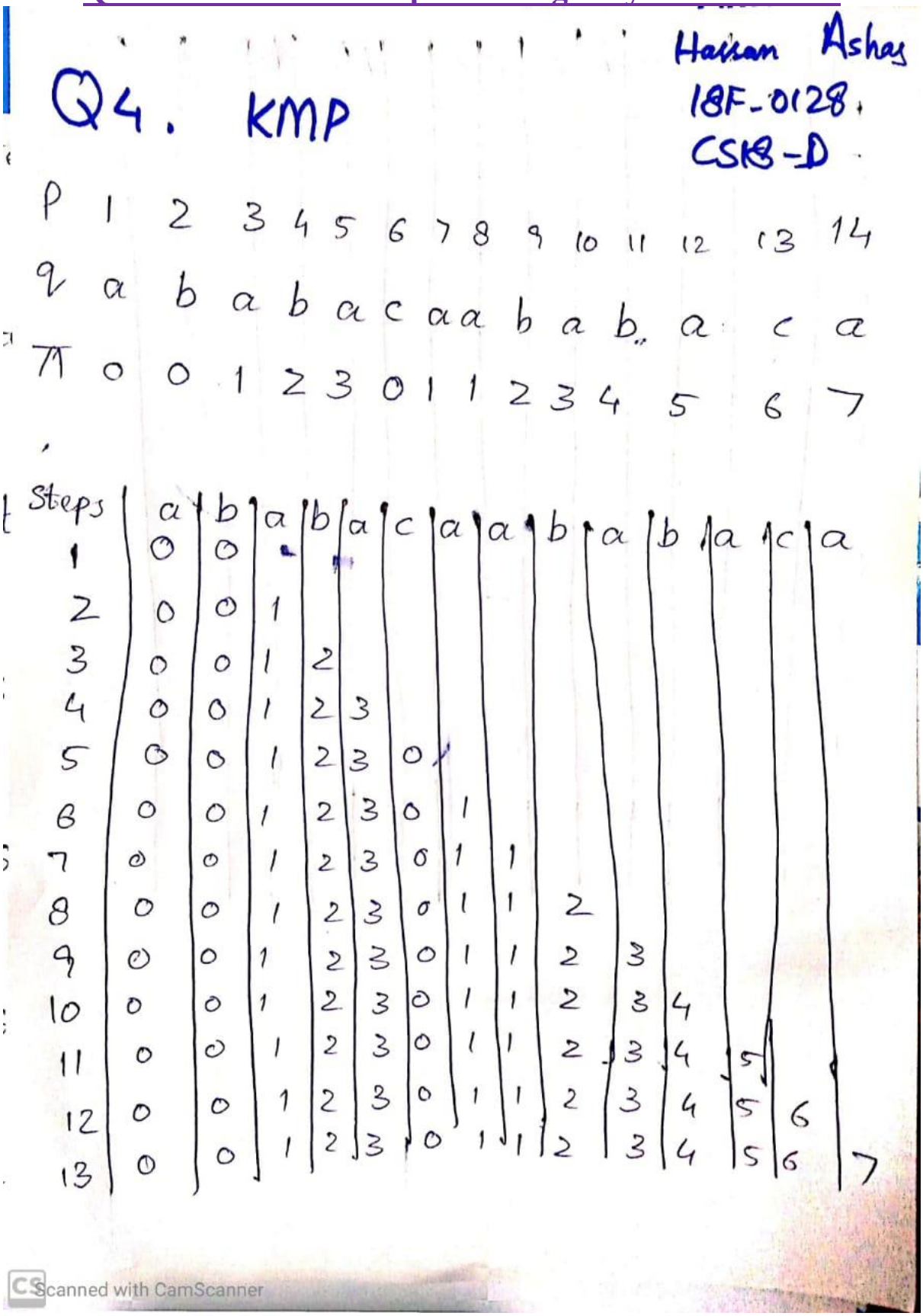
```
COMPUTE-PREFIX-FUNCTION(P)
1  m ← length[P]
2  π[1] ← 0
3  k ← 0
4  for q ← 2 to m
5       do while k > 0 and P[k + 1] ≠ P[q]
6             do k ← π[k]
7          if P[k + 1] = P[q]
8            then k ← k + 1
9          π[q] ← k
10 return π
```

Step - 1														
p	1	2	3	4	5	6	7	8	9	10	11	12	13	14
q	a	b	a	b	a	c	a	a	b	a	b	a	c	a
Π	0	0												

Step - 2														
p	1	2	3	4	5	6	7	8	9	10	11	12	13	14
q	a	b	a	b	a	c	a	a	b	a	b	a	c	a
Π	0	0	1											

Step - 3														
p	1	2	3	4	5	6	7	8	9	10	11	12	13	14
q	a	b	a	b	a	c	a	a	b	a	b	a	c	a
Π	0	0	1	2										

Question 4: Solution: Upload Image of your work here



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Step 1: $q = 2$
$k = 0$
$\pi[q] = 0$

step 2: $q = 3$
$k = 0$
$\pi[q] = 1$

step 3: $q = 4$
$k = 1$
$\pi[q] = 2$

step 4: $q = 5$
$k = 2$
$\pi[q] = 3$

step 5: $q = 6$
$k = 3$
$\pi[q] = 0$

step 6: $q = 7$
$k = 0$
$\pi[q] = 1$

step 7: $q = 8$
$k = 1$
$\pi[q] = 1$

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Step 8: $q = 9$
$k = 1$
$\pi[q] = 2$

Step 9: $q = 10$
$k = 2$
$\pi[q] = 3$

Step 10: $q = 11$
$k = 3$
$\pi[q] = 4$

Step 11: $q = 12$
$k = 0$
$\pi[q] = 5$

Step 12: $q = 13$
$k = 1$
$\pi[q] = 6$

Step 13: $q = 14$
$k = 6$
$\pi[q] = 7$