بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِيْمِ

Data Structures

Autumn - 2017

1.no (a)

The steps of the study of subject data structures :

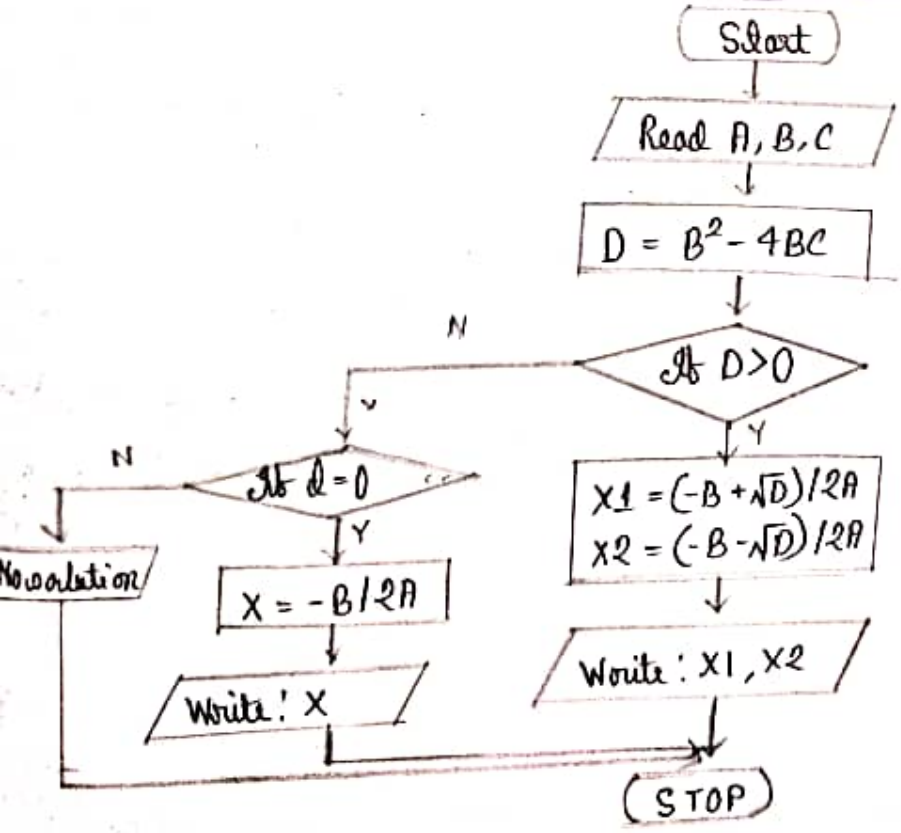
(i) Understanding the purpose and the theory. Find the way to solve a problem.

(ii) Follow the logic of the data structure.

(iii) Implement the algorithm properly.

(iv) Solve the problem with data structure.

1.no (b)



(c)

Here

W = 'XYZST'

The ~~initial~~ substrings of W are

X
XY
XYZ
XYZST
XYZST
Y
YZ
YZS
YZST
Z
ZS
ZST
S
ST
T

The initial substrings are:

X, XY, XYZ, XYZS, XYZST.

(d)

(i) There are $30-3+1=28$ subwords W_K, we have

$P=abc$, $E=(aba)^{10}=abaabaabaabaabaabaabaabaabaabaaba$

$$C=3+1+2+3+1+2+3+1+2+3+1+2+3+1+2+3+1+2+3+1+2+3+1+2=42 \text{ (Ans.)}$$

(ii) There are $40-3+1=38$ subwords W_K, we have

$(cbab)^{10}=cbabcbabcbabcbabcbabcbabcbabcbabcbabcbab$

$C=1+1+3=5$. (Ans.).

2nd

(a)

(i) The number of elements in XXX is $L_1 = 10 - (-10) + 1 = 21$.

" " " " " YYY is $L_2 = 1985 - 1935 + 1 = 51$.

" " " " " ZZZ is $L_3 = 35 - 0 + 1 = 36$.

(ii) The formula is $LOC(YYY[K]) = Base(YYY) + w(K - LB)$

$LOC(YYY[1942]) = 400 + 4(1942 - 1935) = 428$

$LOC(YYY[1977]) = 400 + 4(1977 - 1935) = 568$.

(b)

(1) Set n = 25, EVNUM = 0, ODNUM = 0.

(2) Repeat for K = 1 to K <= n.

If (A[K] % 2 = 0)

Set EVNUM = EVNUM + 1

Else

Set ODNUM = ODNUM + 1

(3) Write: EVNUM, ODNUM.

(4) Exit.

(c)

For ITEM = 40

(i) Initially, BEG = 1 and END = 13, Hence

MID = [(1+13)/2] = 7

DATA[MID] = 55

(ii) Since 40<55, END will change its value by END = MID - 1 = 6

Then, MID = [(1+6)/2] = 3

DATA[MID] = 30

(iii) Since 40>30, BEG will change its value by BEG = MID + 1 = 4

Then, MID = [(4+6)/2] = 5

DATA[MID] = 40

We have found ITEM in Location LOC = MID = 5.

For ITEM = 85

(i) Initially, BEG = 1 and END = 13, MID = 7, DATA[MID] = 55

(ii) Since 85>55, BEG will change its value by BEG = MID + 1 = 8

Then MID = [(8+13)/2] = 10

DATA[MID] = 77

(iii) Since 85>77, BEG will change its value by BEG = MID + 1 = 11

Then, MID = [(11+13)/2] = 12

DATA[MID] = 88

(iv) Since 85<88, END will change its value by END = MID - 1 = 11

MID = (11+11)/2 = 11

DATA[MID] = 80

(v) Since 85>80, BEG will change its value by BEG = MID + 1 = 12

As BEG > END hence ITEM doesn't exist in DATA.

(d)

Sparse matrices: Matrices with a relatively high proportion of zero entries are called sparse matrices.

Ans to the Qu no 3

a)

(i) (**) London , Berlin , Rome , Paris , ___ , ___

1 * London , Berlin , Rome , Paris , Athens , ___

2 * London , Berlin , Rome , Paris , ___ , ___

3 * London , Berlin , Rome , ___ , ___ , ___

4 * London , Berlin , Rome , Madrid , ___ , ___

* London , Berlin , Rome , Madrid , Moscow , ___

* London , Berlin , Rome , Madrid , ___ , ___

(ii) If the ~~stack~~ operation pop(stack, ITEM) deletes London the STACK will be "Empty".

3(b)

Here Top = 3 , Stack : 5, 2, 3, —, —, —

(i) Call POP(STACK, ItemA)

ItemA = 3

top = 2 , Stack : 5, 2, —, —, —, —

Call POP(STACK, ItemB)

ItemB = 2

top = 1 , Stack : 5, —, —, —, —, —

Call Push(STACK, ItemB + 2)

top = 2 , Stack : 5, 4, —, —, —, —

Call Push(STACK, 8)

top = 3 , Stack : 5, 4, 8, —, —, —

Call Push(STACK, ItemA + ItemB)

top = 4, Stack : 5, 4, 8, 5, —, —

(ii) POP and Print ItemA

Output : ~~5, 1, 8, 5~~. 5, 8, 4, 5.

(2)

3(c)

Symbol Scanned		STACK	Expression P
No	(Start)	(	
1	(	((	
2	(	(((	
3	A	(((	A
4	+	(((+	A
5	B	(((+	AB
6	)	((	AB+
7	/	((/	AB+
8	D	((/	AB+D
9	)	(	AB+D/
10	↑	(↑	AB+D/
11	(	(↑(	AB+D/
12	(	(↑((	AB+D/
13	E	(↑((	AB+D/E
14	-	(↑((-	AB+D/E
15	F	(↑((-	AB+D/EF
16	)	(↑(	AB+D/EF-
17	*	(↑(*	AB+D/EF-G
18	G	(↑(*	AB+D/EF-G
19	)	(^	AB+D/EF-G*
20	)	(End)	AB+D/EF-G*↑

4) b) The bubble sort algo is, written below,

1). Repeat steps 2 and 3 for K=1 to n-1

2). Set PTR = 1

3). Repeat while PTR <= N-K

4) (a) If DATA[PTR] > DATA[PTR+1]

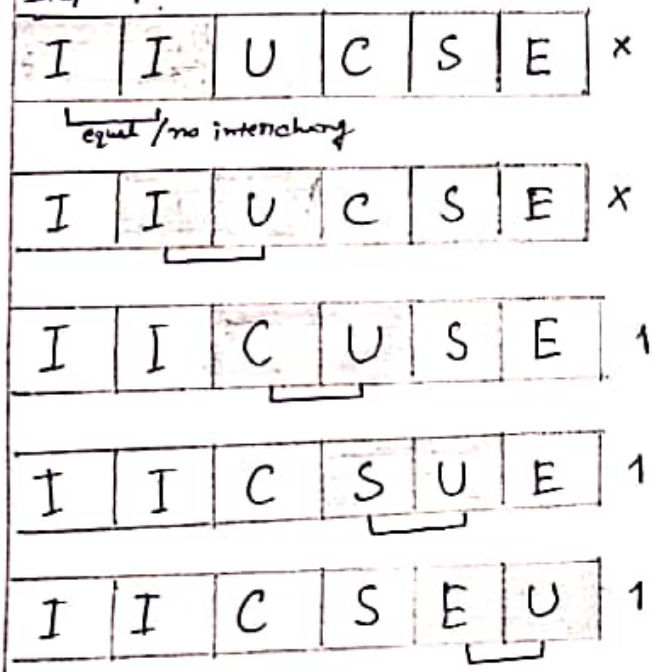
Interchange DATA[PTR] and DATA[PTR+1]

(b) Set PTR := PTR+1

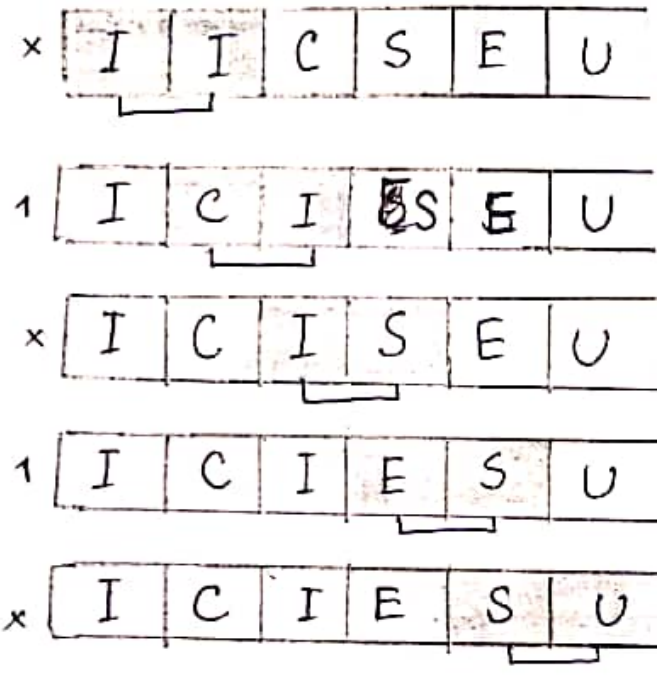
5). Exit.

Here,

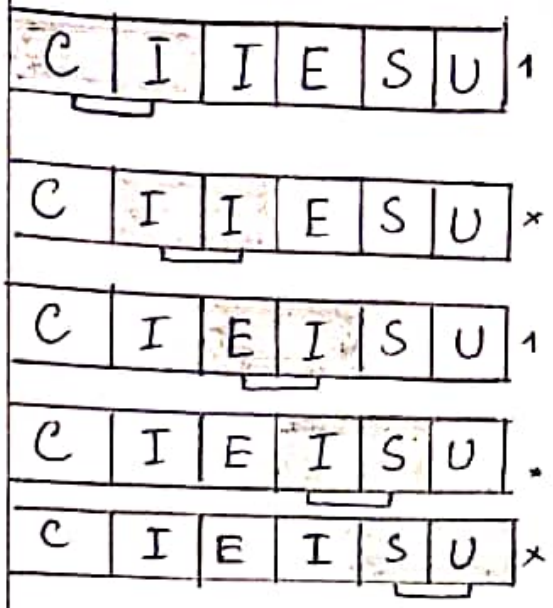
Step-1:



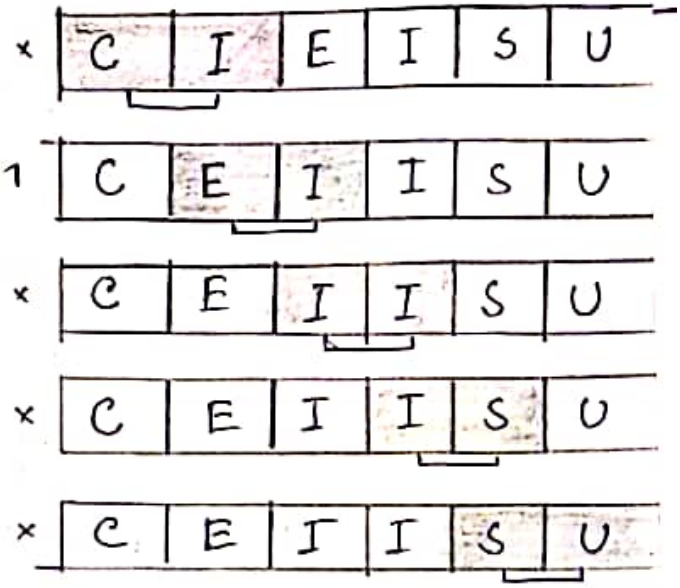
Step - 2:



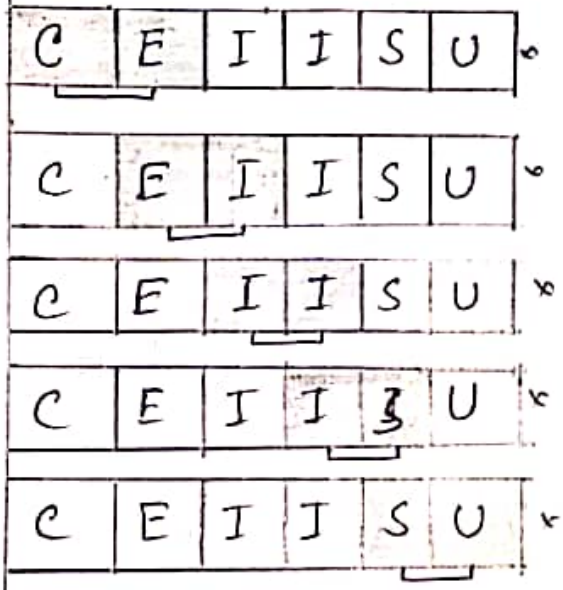
Step-3



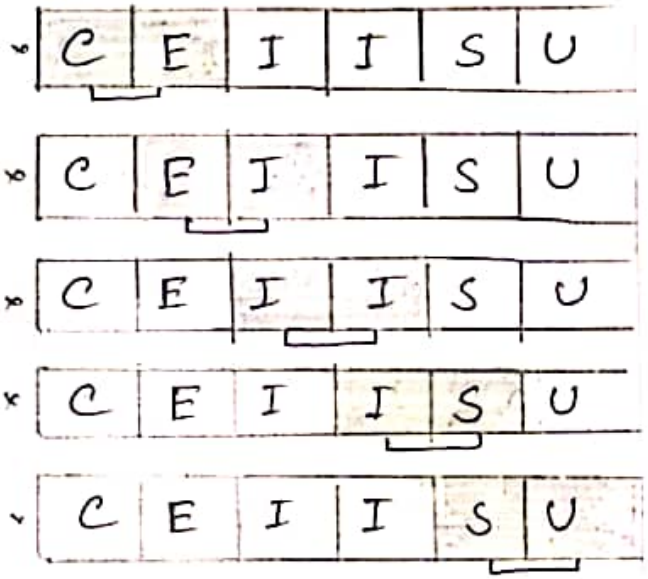
Step-4



Step-5



Step-6



The Number of comparison C = 30 . . &

the number of Interchange D = 8

By

4(c)

Symbol	Stack
3	3
5	3, 5
+	8
6	8, 6
4	8, 6, 4
−	8, 2
*	16
4	16, 4
1	16, 4, 1
−	16, 3
2	16, 3, 2
↑	16, 9
+	25