UNIVERSITY OF KARACHI
(UOK)

ACADEMIC YEAR-2021

DEPARTMENT OF COMPUTER SCIENCE

MORNING PROGRAMME

MCS (FINAL)- 4th SEMESTER

COURSE TITLE: "ARTIFICIAL INTELLIGENCE"
COURSE CODE: CS-616

SUBMITTED TO:

TEACHER NAME: MISS SAIMA ASHRAF

SUBMITTED BY:

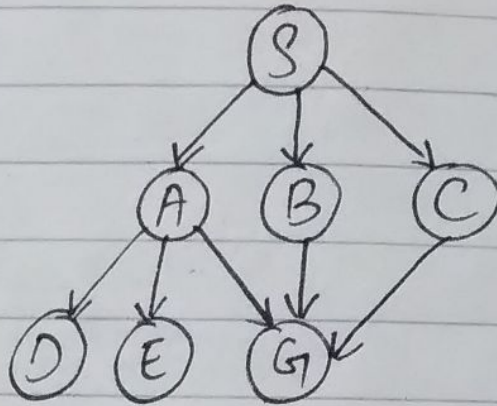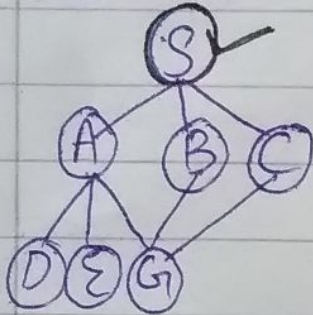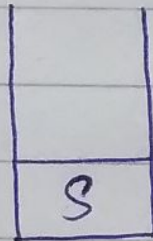|	
STUDENT NAME:	**NEHA ADIL**
SEAT NO:	**P19101049**
ENROLLMENT NO:	**SCI/DCS/KU-7276/2019**

"ASSIGNMENT # 02"
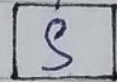
Question # 01 :-
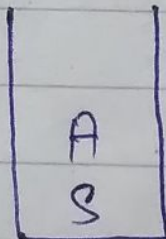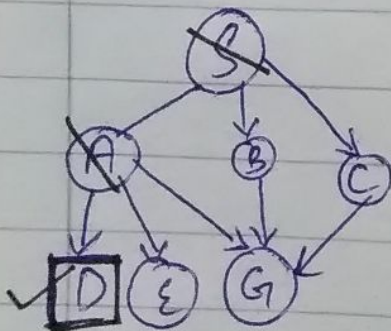
Q Example of Depth First Search :

Solution :-

Stack:

S

Output :

S

Stack:

A
S

Output :

S A

Stack:

D → pop
A
S

Output :

S A D
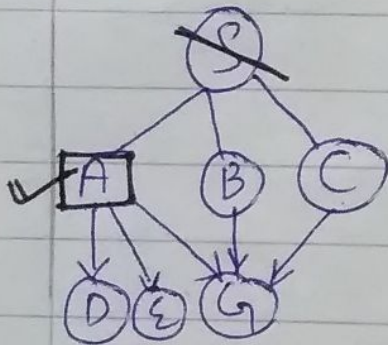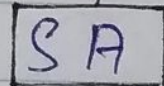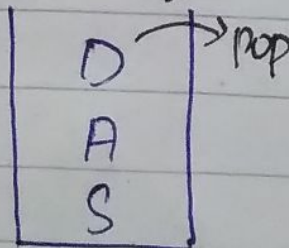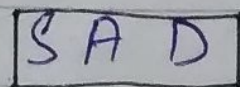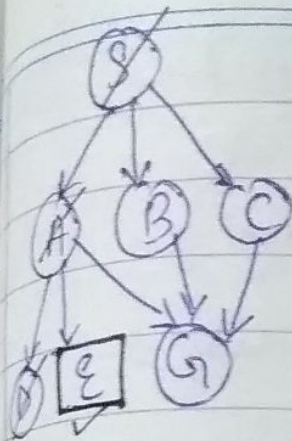
Stack:

```
E
A
S
```

Output: S A D E

E → pop D has no children, pop from stack...

Stack:

```
G
A
S
```

Output: S A D E G

G → pop E has no children, pop from stack...

Output: S A D E G B

Stack:

```
S
```
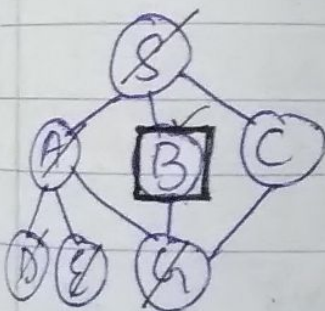
G has no children, pop from stack....

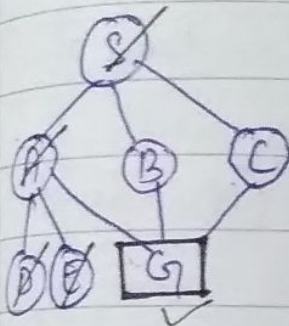A has children, but they've all been visited so pop A.
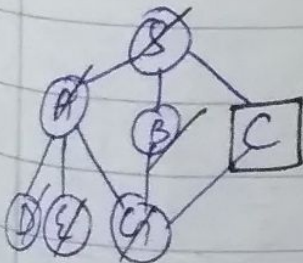
Stack:

Output: S A D E G B C

B has children, but they've been visited...doesn't get added to stack.

S → pop
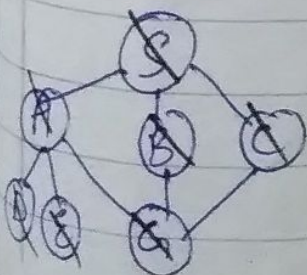
Stack:

Output: S A D E G B C

C has children, but they've been visited...doesn't get added to stack

S has children but they've all been visited.... POP S.

Question # 02:

Q Example of Depth Limited Search:

DO it for limit 03 and 04.

For Level 3:-

1) Stack:

Output

| A |

2) Stack:

| B |
| A |

Output

| A B |

3) Stack:

| E |
| B |
| A |

Output:

| A B E |

Stack:

```
I → pop
E → pop
B
A
```
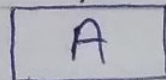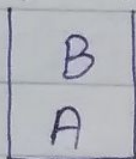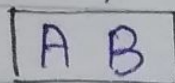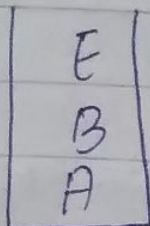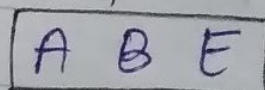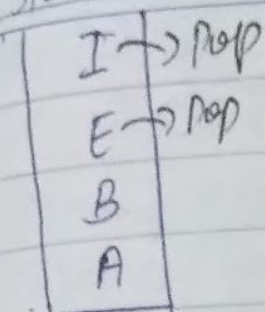
Output.

$$\boxed{A \ B \ E \ I}$$

Stack:
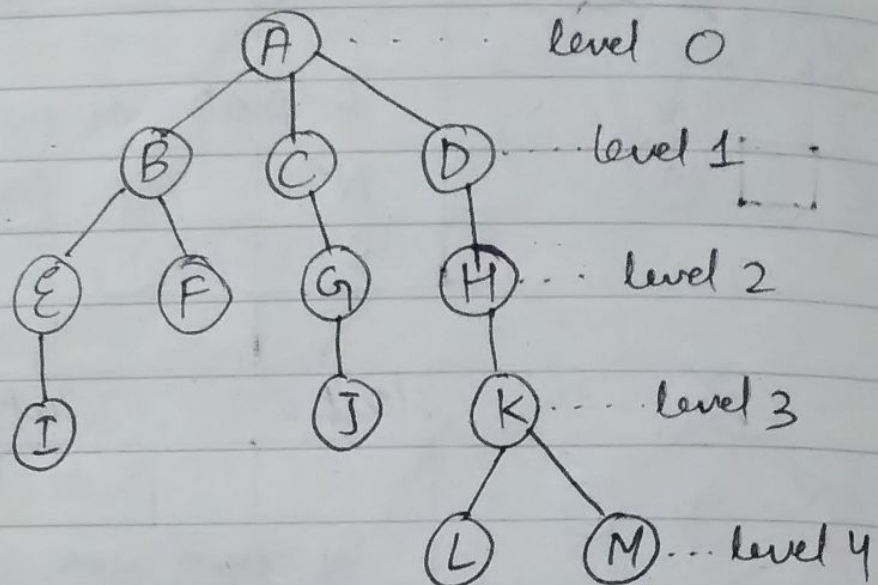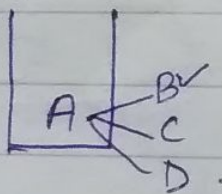
Output:

$$\boxed{A \ B \ E \ I \ F}$$

```
F → pop
B → pop
A
```
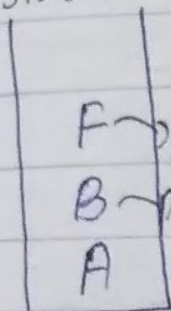
Since, I has no children, pop from Stack.

E has children, but they've all been visited so pop E.

Stack:

Output:

$$\boxed{A \ B \ E \ I \ F \ C}$$

```
C
A
```
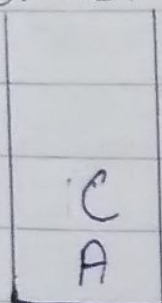
F has no children, pop from Stack.

B has children, but they've all been visited so pop B.

Stack:

```
G
C
A
```

Output:

$$\boxed{A \ B \ E \ I \ F \ C \ G}$$

Stack:

```
J → pop
G → pop
C
A
```
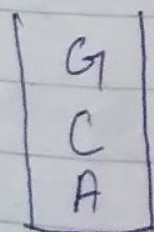
Output.

$$\boxed{A \ B \ E \ I \ F \ C \ G \ J}$$

9) Stack :

Output :-

$$\boxed{A \; B \; E \; I \; F \; C \; G \; J \; D}$$

| D |
| A |
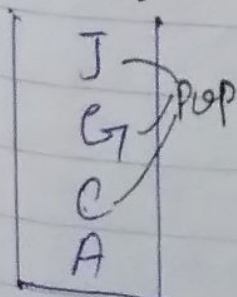
↳ J has no children, pop from stack,
↳ G has children, but they've all been visited so pop G.
↳ C has children, but they've all been visited so pop C.

10) Stack :

| H |
| D |
| A |

Output.

$$\boxed{A \; B \; E \; I \; F \; C \; G \; J \; D \; H}$$

11) Stack :

| K |
| H | ⟩ pop
| D |
| A |

Output :

$$\boxed{A \; B \; E \; I \; F \; C \; G \; J \; D \; H \; K}$$

12)

| |
| |
| |

• K has no children, pop from stack.
• H has children, but they've been visited so pop H.
• D has children, but they've been visited so pop D.

Stack is empty.

• A has children but they've all been visited so pop A.

For Level 4 :-

The Stack will be same from step # 01 to step # 11. from level # 03.
So we continue from step # 11 to proceed further for level 4.

Step # 11⌄

11) Stack

K
H
D
A

Output :

$$\boxed{A\ B\ E\ I\ F\ C\ G\ J\ D\ H\ K}$$

12) Stack :

L → pop
K
H
D
A

Output :

$$\boxed{A\ B\ E\ I\ F\ C\ G\ J\ D\ H\ K\ L}$$

13) Stack :

M
K
H
D
A

Output :

$$\boxed{A\ B\ E\ I\ F\ C\ G\ J\ D\ H\ K\ L\ M}$$

L has no children, pop from stack.

(14)

Stack:

- M has no children, pop form stack.
- K has children, but they all have been visited so pop k.
- H has children, but they've all been visited so pop H.
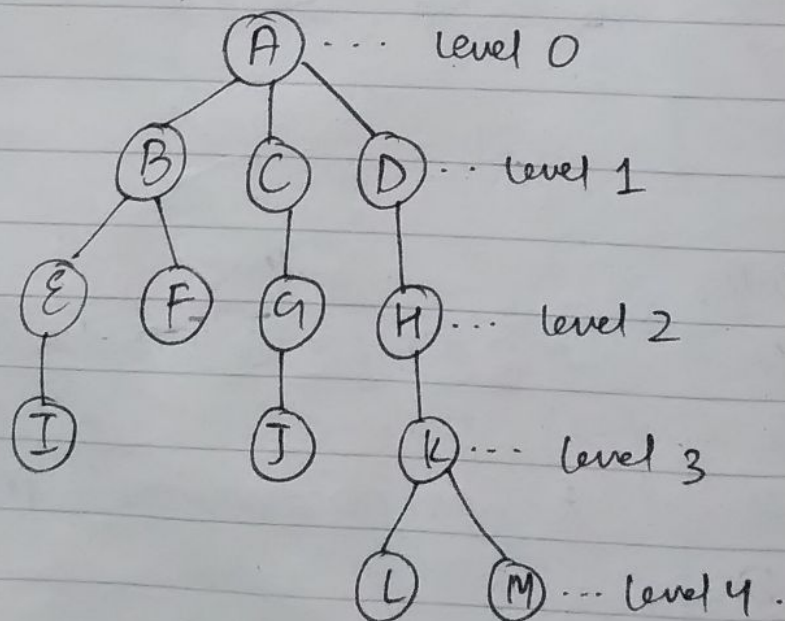- D has children but they've all been visited so pop D.
- A has children but they've all been visited so pop A.
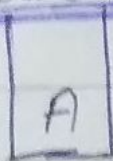
Output :-

| A | B | E | I | F | C | G | J | D | H | K | L | M | Ans.

Question # 03r
Example of Iterative deeping Search r
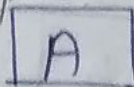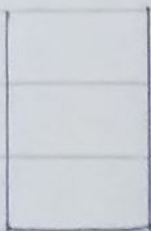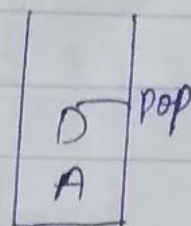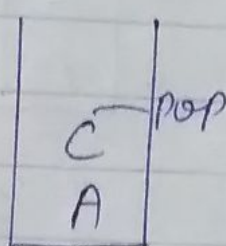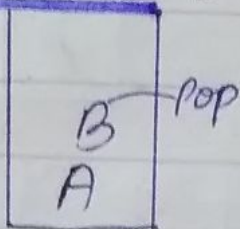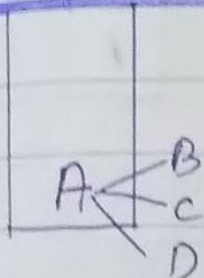
Solution :

Consider Level O :-

```
┌─┬─┐
│A│ │          Output :
└─┴─┘          ┌───┐
Stack.         │ A │  Au
               └───┘
```

Consider Level 1 :-

```
┌─┬─┐      ┌─┬─┐ pop   ┌─┬─┐ pop   ┌─┬─┐ pop
│ │ │      │B│ │       │C│ │       │D│ │
│A← B      │A│ │       │A│ │       │A│ │
│   C      └─┴─┘       └─┴─┘       └─┴─┘
│   D
└───┘
┌─┬─┐
│ │ │
│ │ │
└─┴─┘
```

B, C, D has no children, pop
from stack.
A has children, but they all have
been visited so pop A.

Output :
```
┌─────────┐
│ A B C D │  Au
└─────────┘
```

Consider Level 2 :-

```
┌─┬─┐        ┌─┬─┐      ┌─┬─┐ pop   ┌─┬─┐ pop
│ │ │        │B< E      │E│ │       │F│ │
│A← B        │   F      │B│ │       │B│ │
│   C        │A│ │      │A│ │       │A│ │
│   D        └─┴─┘      └─┴─┘       └─┴─┘
└───┘

┌─┬─┐        ┌─┬─┐ pop   ┌─┬─┐      ┌─┬─┐ pop   ┌─┬─┐
│ │ │        │G│ │       │ │ │      │H│ │       │ │ │
│C← G        │C│ │       │D─H       │D│ │       │ │ │
│A│ │        │A│ │       │A│ │      │A│ │       │ │↓│
└─┴─┘        └─┴─┘       └─┴─┘      └─┴─┘       Empty
```

Output :
```
┌───────────────┐
│ A B E F C G D H │  Au
└───────────────┘
```

Consider Level 3:-

```
┌──────┐         ┌──────┐         ┌──────┐ I      ┌──────┐ I ─ Pop
│      │         │   ε  │         │ E ─┤         │ E      │
│      │         │ B ─┤ F│         │ B  │         │ B      │
│ A ─┤ B│         │ A    │         │ A  │         │ A      │
│     C│         │      │         │    │         │        │
│     D│         └──────┘         └────┘         └────────┘
└──────┘
```

```
┌──────┐ Pop    ┌──────┐ Pop    ┌──────┐ Pop    ┌──────┐ C ─ G
│ ε ─┤         │ F ─┤         │ B ─┤         │ C ─┤
│ B  │         │ B  │         │ A  │         │ A  │
│ A  │         │ A  │         │    │         │    │
└────┘         └────┘         └────┘         └────┘
```

```
┌──────┐ G ─ J  ┌──────┐ J ─ Pop ┌──────┐ G ─ Pop ┌──────┐ C ─ Pop
│ G  │         │ J  │         │ G  │         │ C ─┤
│ C  │         │ G  │         │ C  │         │ A  │
│ A  │         │ C  │         │ A  │         │    │
└────┘         │ A  │         │    │         └────┘
               └────┘         └────┘
```

```
┌──────┐ D ─ H  ┌──────┐ H ─ K  ┌──────┐ K ─ Pop ┌──────┐ H ─ Pop
│ D ─┤         │ H  │         │ K  │         │ H  │
│ A  │         │ D  │         │ H  │         │ D  │
│    │         │ A  │         │ D  │         │ A  │
└────┘         └────┘         │ A  │         └────┘
                              └────┘
```

```
┌──────┐ D ─ Pop ┌──────┐
│ D  │          │      │
│ A  │          │ A ─ Pop
└────┘          └──────┘
```

Output :-

~~ABEIFD~~

```
ABEIFCGJDHK
```

Consider Level 4 &

A B C D

B E F / A

E I / B / A

I POP / E / B / A

E POP / B / A

F POP / B / A

B POP / A

C G / A

G J / C / A

J POP / G / C / A

G POP / C / A

C POP / A

D H / A

H K / D / A

K L M / H / D / A

L POP / K / H / D / A

M POP / K / H / D / A

K POP / H / D / A

H POP / D / A

D POP / A

A POP
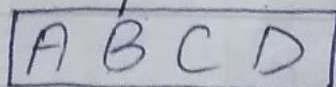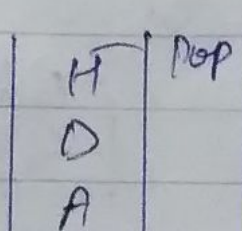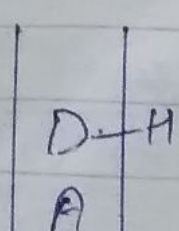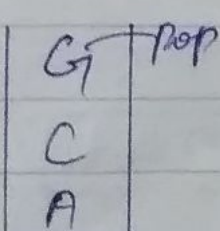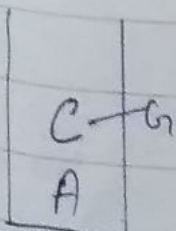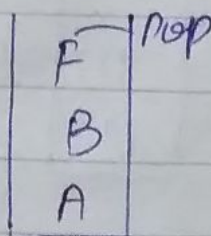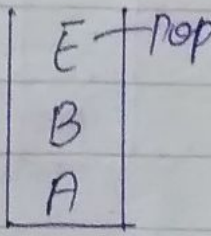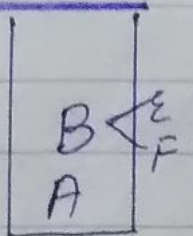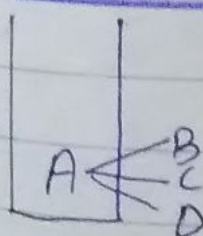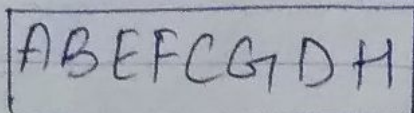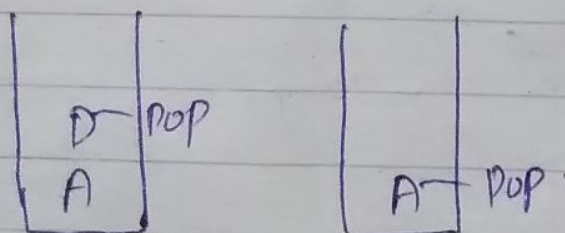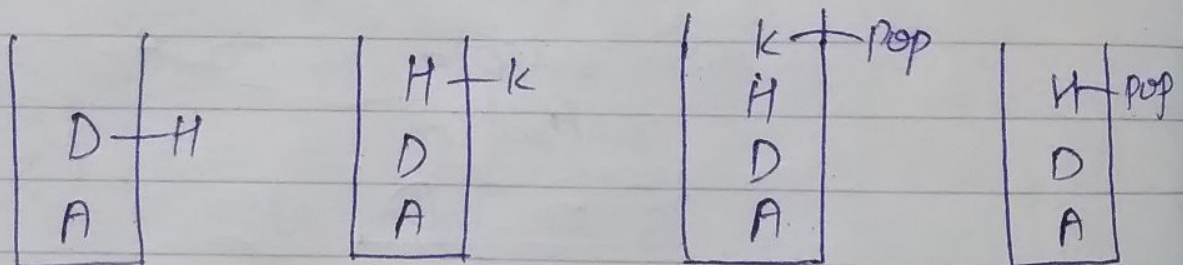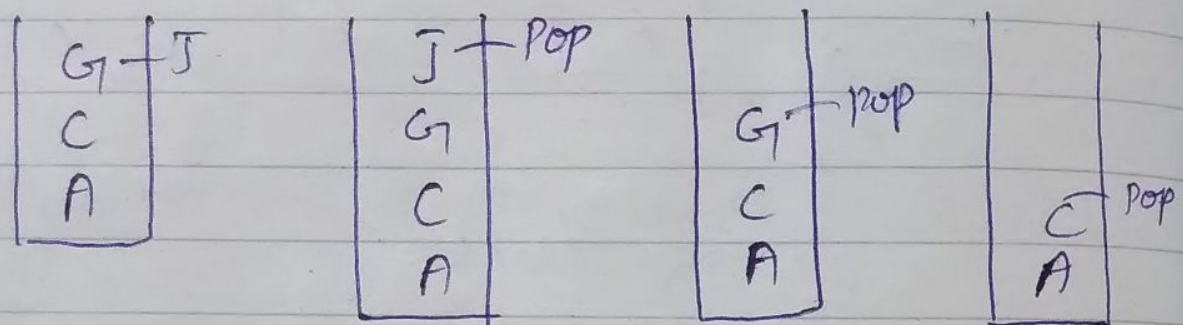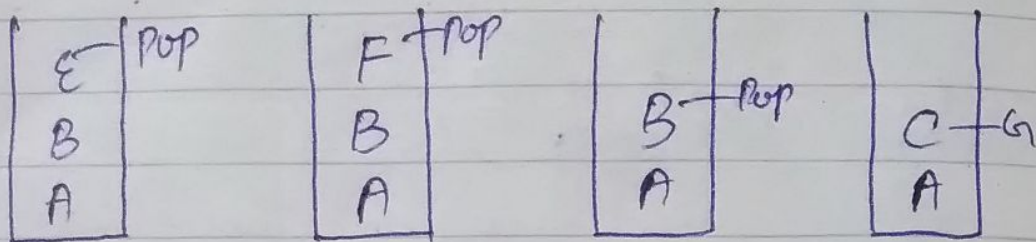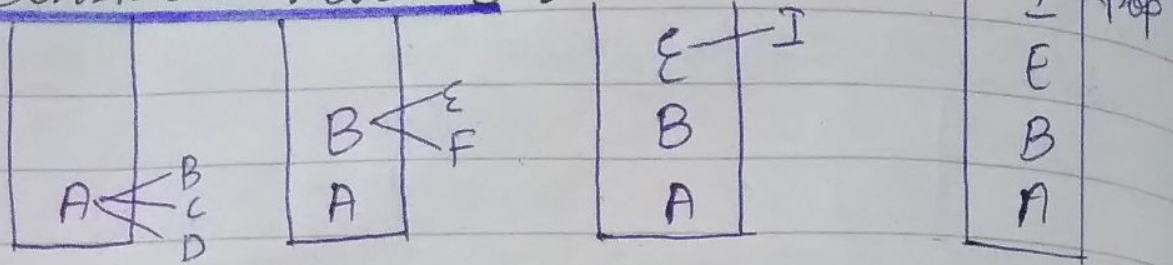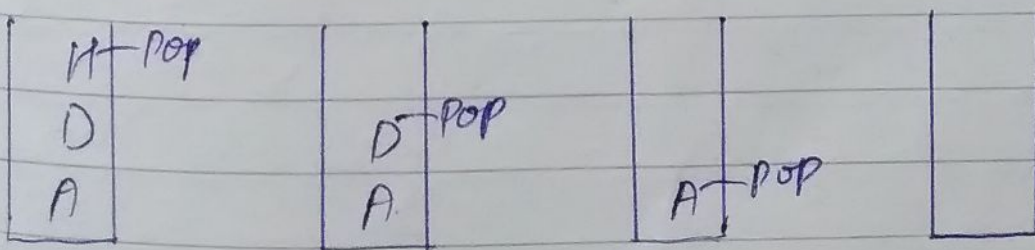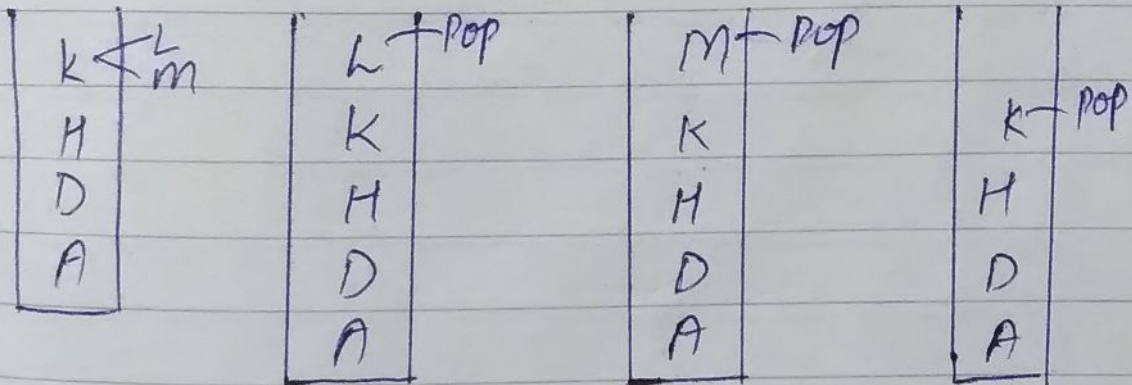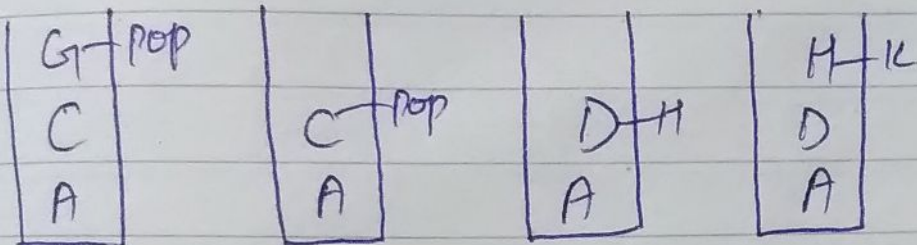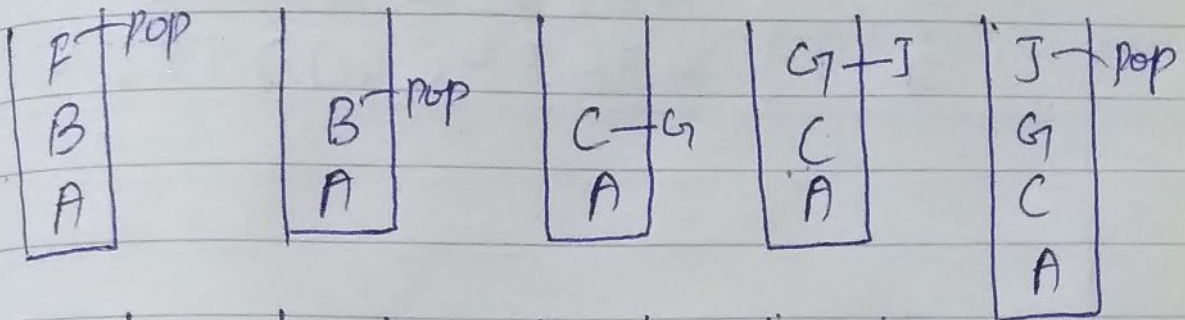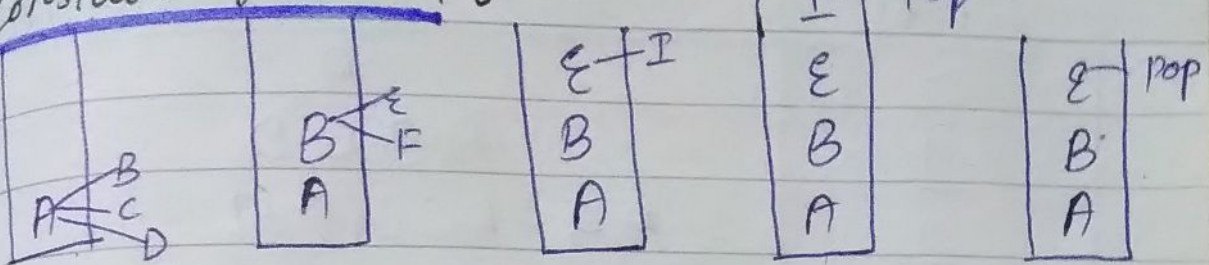
Output &

| A B E I F C G J D H K L M |

Level	IDS Traversal Output
0	A
1	A B C D
2	A B E F C G D H
3	A B E B I F C G J D H K
4	A B E I F C G J D H K L M