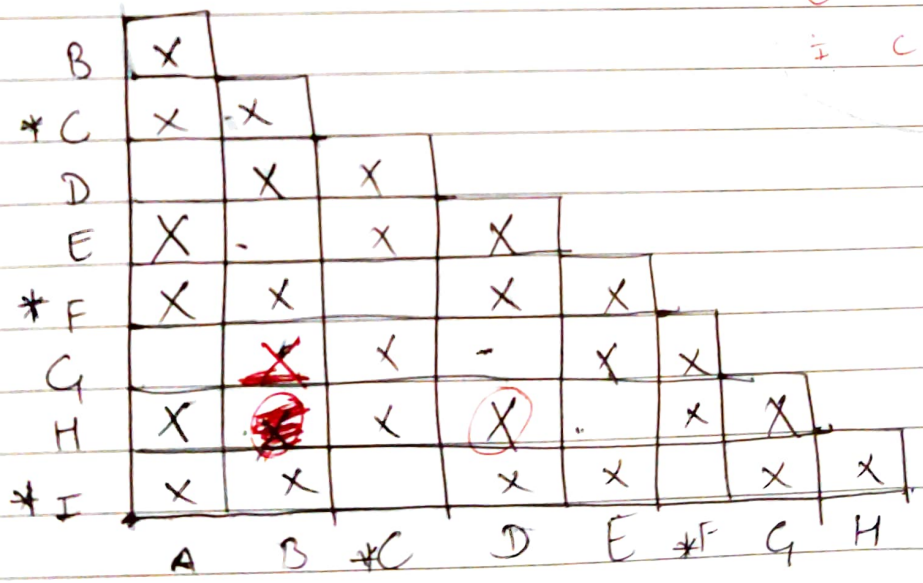
1) Draw the following DFA using table filling algorithm where A is the start state. The states C, F and I are the final states.

| δ | 0 | 1 |
|---|---|---|
| A | B | E |
| B | C | F |
| *C | D | H |
| D | E | H |
| E | F | I |
| *F | G | B |
| G | H | B |
| H | I | C |
| *I | A | E |

C F F F
H B NF NF

C F F F
I C F F

E H NF NF
I C F F




step 1:- cross combination of final and non final states.

comb. of A & B

| | 0 | 1 | |
|---|---|---|---|
| A | B | E | (NF, NF) |
| B | C | F | (F, F) |

A & D

| | 0 | 1 | |
|---|---|---|---|
| A | B | E | (NF, NF) |
| D | E | H | (NF, NF) |

A & E

| | 0 | 1 | | |
|---|---|---|---|---|
| A | B | E | NF | NF |
| E | F | I | F | F |

A & G

| | 0 | 1 | | |
|---|---|---|---|---|
| A | B | E | NF | NF |
| G | H | B | F | F |

A & H

| | 0 | 1 | | |
|---|---|---|---|---|
| A | B | E | NF | NF |
| H | I | C | F | F |

| | 0 | 1 | | |
|---|---|---|---|---|
| B | C | F | F | F |
| D | E | H | NF | NF |

| | 0 | 1 |
|---|---|---|
| B | C | F |

E

| | 0 | 1 |
|---|---|---|
| B | | |
| G | | |

__/__/__

| | 0 | 1 | |
|---|---|---|---|
| A | B | E | NF NF |
| D | E | H | NF NF |

| | 0 | 1 | |
|---|---|---|---|
| A | B | E | NF NF |
| G | H | B | NF NF |

| | 0 | 1 | X |
|---|---|---|---|
| A | B | E | |
| H | I | C | |

NF F  NF F

| | 0 | 1 | |
|---|---|---|---|
| B | C | F | F F |
| D | E | H | NF NF |

| | 0 | 1 | |
|---|---|---|---|
| B | C | F | F F |
| E | F | I | F F |

| | 0 | 1 | |
|---|---|---|---|
| B | B | E | NF NF |
| G | H | B | NF NF |

| | 0 | 1 | |
|---|---|---|---|
| B | B | E | NF NF |
| H | I | C | F F |

__/__/____

| | 0 | 1 | | |
|---|---|---|---|---|
| C* | D | H | NF | NF |
| F | G | B | NF | NF |

| | 0 | 1 | | |
|---|---|---|---|---|
| C | D | H | NF | NF |
| I | A | E | NF | NF |

| | | 0 | 1 | | |
|---|---|---|---|---|---|
| (X) | D | E | H | NF | NF |
| | E | F | I | F | F |

| | 0 | 1 | | |
|---|---|---|---|---|
| D | E | H | NF | NF |
| G | H | B | NF | NF |

| | | 0 | 1 | | |
|---|---|---|---|---|---|
| (X) | D | E | H | NF | NF |
| | H | I | C | F | F |

| | | 0 | 1 | | |
|---|---|---|---|---|---|
| (X) | E | F | I | F | F |
| | G | H | B | NF | NF |

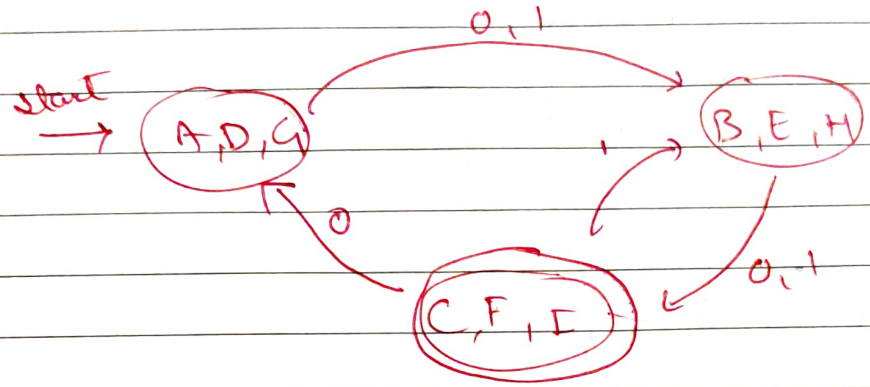
| | 0 | 1 | | |
|---|---|---|---|---|
| E | F | I | F | F |
| H | I | C | F | F |

| | | 0 | 1 | | |
|---|---|---|---|---|---|
| (X) | G | H | B | NF | NF |
| | H | I | C | ~~NF~~ | F |

__/__/____

Pairs

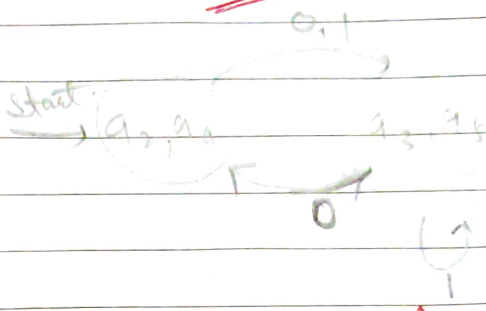
(A,D) (A,G) (D,G) → (A,D,G)
(B,H) (B,E) (E,H) → (B,H,E)
(C,F) (C,I) (F,I) → (C,F,I)
(D,H) → → (D,H)



Q. Consider the DFA given by the transition table.

| δ | 0 | 1 |
|---|---|---|
| → $q_1$ | $q_2$ | $q_3$ |
| $q_2$ | $q_3$ | $q_5$ |
| * $q_3$ | $q_4$ | $q_3$ |
| $q_4$ | $q_3$ | $q_5$ |
| * $q_5$ | $q_2$ | $q_5$ |

Ans




| | $q_1$ | $q_2$ | *$q_3$ | $q_4$ |
|---|---|---|---|---|
| $q_2$ | x | | | |
| *$q_3$ | x | x | | |
| $q_4$ | x | | x | |
| *$q_5$ | x | x | | x |

$(q_2, q_4)$
$(q_3, q_5)$

| | 0 | 1 | | |
|---|---|---|---|---|
| ✓ $q_2$ | $q_3$ | $q_5$ | NF | F |
| $q_4$ | $q_3$ | $q_5$ | F | F |

| | 0 | 1 | | |
|---|---|---|---|---|
| $q_1$ | $q_2$ | $q_3$ | ~~X~~ NF | F |
| $q_2$ | $q_3$ | $q_5$ | F | F |

| | 0 | 1 | | |
|---|---|---|---|---|
| $q_1$ | $q_2$ | $q_3$ | NF | F |
| $q_4$ | $q_3$ | $q_5$ | F | F |

| | 0 | 1 | | |
|---|---|---|---|---|
| ✓ $q_3$ | $q_4$ | $q_3$ | NF | F |
| $q_5$ | $q_2$ | $q_5$ | NF | F |

$(q_2, q_4)$ is equivalent because they reach same destination.