top = 116 ⊕ 111 ⊕ 112 = 107 mod 11 = 8

tree = 116 ⊕ 114 ⊕ 101 ⊕ 101 = 6

root = 114 ⊕ 111 ⊕ 111 ⊕ 116 = 6

AVL = 65 ⊕ 86 ⊕ 76 = 91 mod 11 = 3

exam = 101 ⊕ 120 ⊕ 97 ⊕ 109 = 17 mod 11 = 6

pass = 112 ⊕ 97 ⊕ 115 ⊕ 115 = 17 mod 11 = 6

fail = 102 ⊕ 97 ⊕ 105 ⊕ 108 = 2

DS = 68 ⊕ 83 = 23 mod 11 = 1

PQ = 80 ⊕ 81 = 1

stack = 115 ⊕ 116 ⊕ 97 ⊕ 99 ⊕ 107 = 110 mod 11 = 0

pot = 112 ⊕ 111 ⊕ 116 = 107 mod 11 = 8

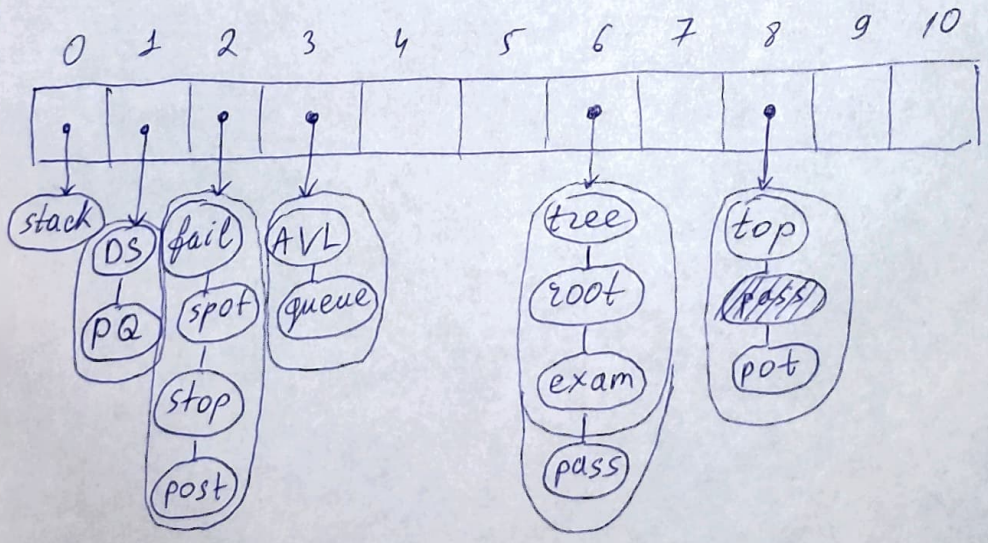
spot = 115 ⊕ 112 ⊕ 111 ⊕ 116 = 24 mod 11 = 2

stop = 115 ⊕ 116 ⊕ 111 ⊕ 112 = 24 mod 11 = 2

post = 112 ⊕ 111 ⊕ 115 ⊕ 116 = 24 mod 11 = 2

queue = 113 ⊕ 117 ⊕ 101 ⊕ 117 ⊕ 101 = 113 mod 11 = 3

a)



6) 11) top = $116 \cdot 31^2 + 111 \cdot 31 + 112 = 115029$

tree = $116 \cdot 31^3 + 114 \cdot 31^2 + 101 \cdot 31 + 101 = 3568542$

zoot = $114 \cdot 31^3 + 111 \cdot 31^2 + 111 \cdot 31 + 116 = 3506402$

AVL = $65 \cdot 31^2 + 86 \cdot 31 + 76 = 65207$

exam = $101 \cdot 31^3 + 120 \cdot 31^2 + 97 \cdot 31 + 109 = 3127327$

pass = $112 \cdot 31^3 + 97 \cdot 31^2 + 115 \cdot 31 + 115 = 3433489$

fail = $102 \cdot 31^3 + 97 \cdot 31^2 + 105 \cdot 31 + 108 = 3135262$

OS = $68 \cdot 31 + 83 = 2191$

PQ = $80 \cdot 31 + 81 = 2561$

stack = $115 \cdot 31^4 + 116 \cdot 31^3 + 97 \cdot 31^2 + 99 \cdot 31 + 107 = 109757069$

pot = $112 \cdot 31^2 + 111 \cdot 31 + 116 = 111189$

spot = $115 \cdot 31^3 + 112 \cdot 31^2 + 111 \cdot 31 + 116 = 3537154$

stop = $115 \cdot 31^3 + 116 \cdot 31^2 + 111 \cdot 31 + 112 = 3540994$

post = $112 \cdot 31^3 + 111 \cdot 31^2 + 115 \cdot 31 + 116 = 3446944$

queue = $113 \cdot 31^4 + 117 \cdot 31^3 + 101 \cdot 31^2 + 117 \cdot 31 + 101 = 107944209$

MAD – $p = 41$, $a = 19$, $b = 23$

115029 → 11

3568542 → 6

3506402 → 6

65207 → 1

3127327 → 10

3433489 → 8

3135262 → 1

2191 → 3

2561 → 15

109757069 → 9

111189 → 7

3537154 → 3

3540994 → 0

3446944 → 1

107944209 → 11

b) i) top = $116 \cdot 33^2 + 111 \cdot 33^1 + 112 \cdot 33^0 = 130099$

tree = $116 \cdot 33^3 + 114 \cdot 33^2 + 101 \cdot 33 + 101 \cdot 1 = 4296272$

root = $114 \cdot 33^3 + 111 \cdot 33^2 + 111 \cdot 33 + 116 = 4221476$

AVL = $65 \cdot 33^2 + 86 \cdot 33 + 76 = 73699$

exam = $101 \cdot 33^3 + 120 \cdot 33^2 + 97 \cdot 33 + 109 = 3763627$

pass = $112 \cdot 33^3 + 97 \cdot 33^2 + 115 \cdot 33 + 115 = 4134487$

fail = $102 \cdot 33^3 + 97 \cdot 33^2 + 105 \cdot 33 + 108 = 3774780$

DS = $68 \cdot 33 + 83 = 2327$

PQ = $80 \cdot 33 + 81 = 2723$

stack = $115 \cdot 33^4 + 116 \cdot 33^3 + 97 \cdot 33^2 + 99 \cdot 33 + 107 = 140658614$

pot = $112 \cdot 33^2 + 111 \cdot 33 + 116 = 125747$

spot = $115 \cdot 33^3 + 112 \cdot 33^2 + 111 \cdot 33 + 116 = 4258502$

stop = $115 \cdot 33^3 + 116 \cdot 33^2 + 111 \cdot 33 + 112 = 4262854$

post = $112 \cdot 33^3 + 111 \cdot 33^2 + 115 \cdot 33 + 116 = 4149734$

queue = $113 \cdot 33^4 + 117 \cdot 33^3 + 101 \cdot 33^2 + 117 \cdot 33 + 101 = 138327323$

MAD - let's take $p = 41$, $a = 19$, $b = 23$

$(130099 \cdot 19 + 23) \bmod 41$

$[(130099 \cdot 19 + 23) \bmod 41] \bmod 17 = \underline{14}$

$[(4296272 \cdot 19 + 23) \bmod 41] \bmod 17 = \underline{2}$

$[(4221476 \cdot 19 + 23) \bmod 41] \bmod 17 = \underline{13}$

73699 → 14

3763627 → 16

4134487 → 14

3774780 → 1

2327 → 4

2723 → 1

140658614 → 12

125747 → 6

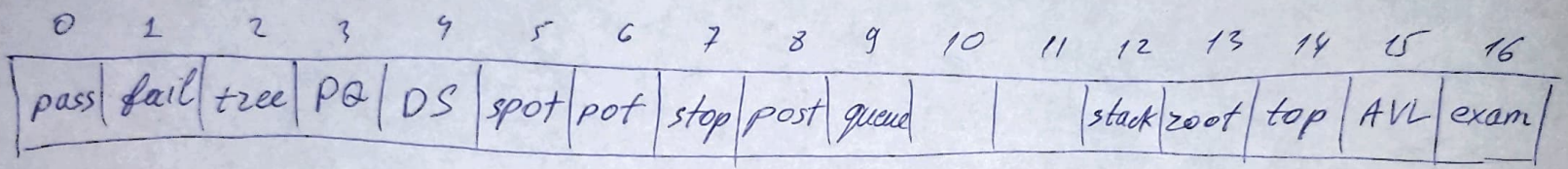
4258502 → 12

4262854 → 3

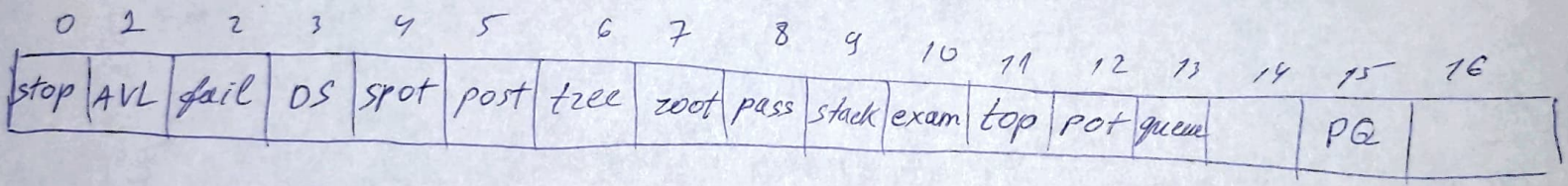
4149734 → 1

138327323 → 14

b) i)


0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
pass
fail
tree
PQ
OS
spot
pot
stop
post
queue
stack
zoot
top
AVL
exam

b) ii)


0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
stop
AVL
fail
OS
spot
post
tree
zoot
pass
stack
exam
top
pot
queue
PQ

8) (ii) J = 74

[(74 . 19 + 23) mod 41] mod 17 = (1) - first step

2. Check at index 1, fail != J

3. index 2, true != J

4. index 3, PQ != J

⋮

11. index 10, table[10] == null, fail.

Total number of steps - (11)

(iv) 2. Check at index 1, fail != J

⋮

15. check at index 14, table[14] == null, fail.

Total number of steps - (15)