

Date _____

Name: Muhammad Ibrahim Khan

Roll No: B20103041

main function

Date _____

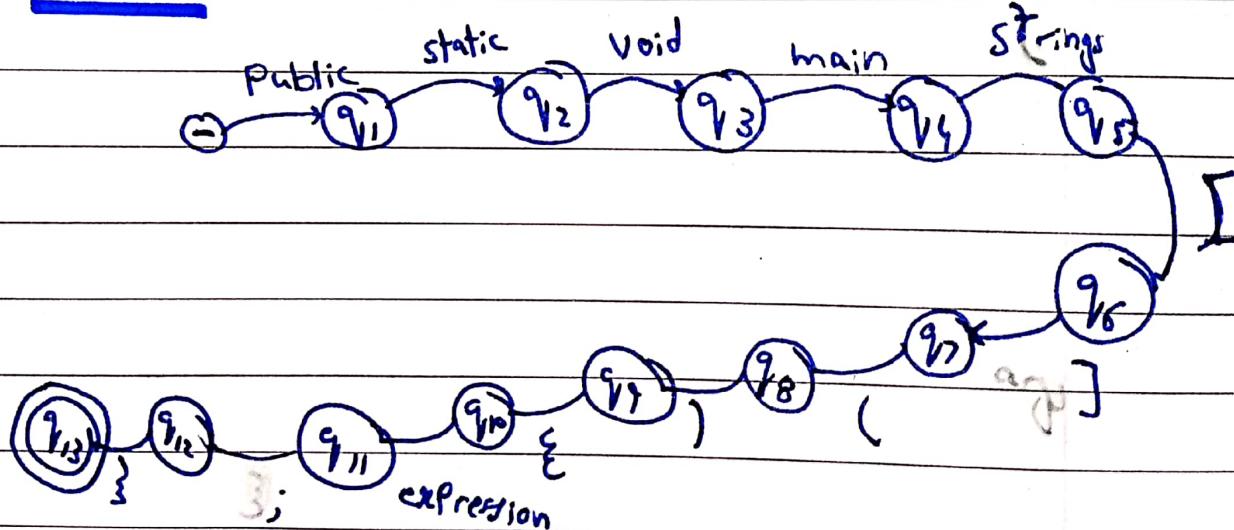
Re:

Main_func: Public | s + static | s + void | s + main | s * |
(| s * string | [|] s + (w * | s *)) | s * | {

CFG:

<function> → "Public", "static", "void", "main" "({"
<args> → "String" "[" "]" <identifier>
<identifier> → <alpha> | <alpha> <alphanumeric>
<alpha> → "a" | "b" | | "z" | "A" | "B" | | "Z"
<alphanumeric> → <alpha> <digit>
<digit> → "0" | "1" | | "9"
<expression>: <single-line> | <multi-line> | <func-call>
<object> | <condition> | <loop> | <value> | <operator>

FA



Special characters

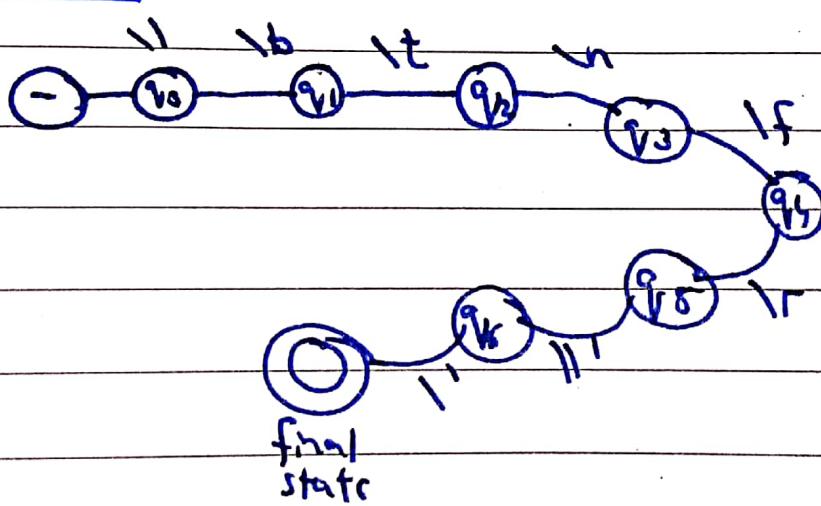
Date _____

RE: \[\bfnfr\]

CFGi $\langle \text{Escape} \rangle \rightarrow " \backslash " \langle \text{char} \rangle$

$\langle \text{char} \rangle \rightarrow "b" | "t" | "n" | "f" | "r" | "l" | "i" | " " | " " | " " | " "$

FA:



Operators

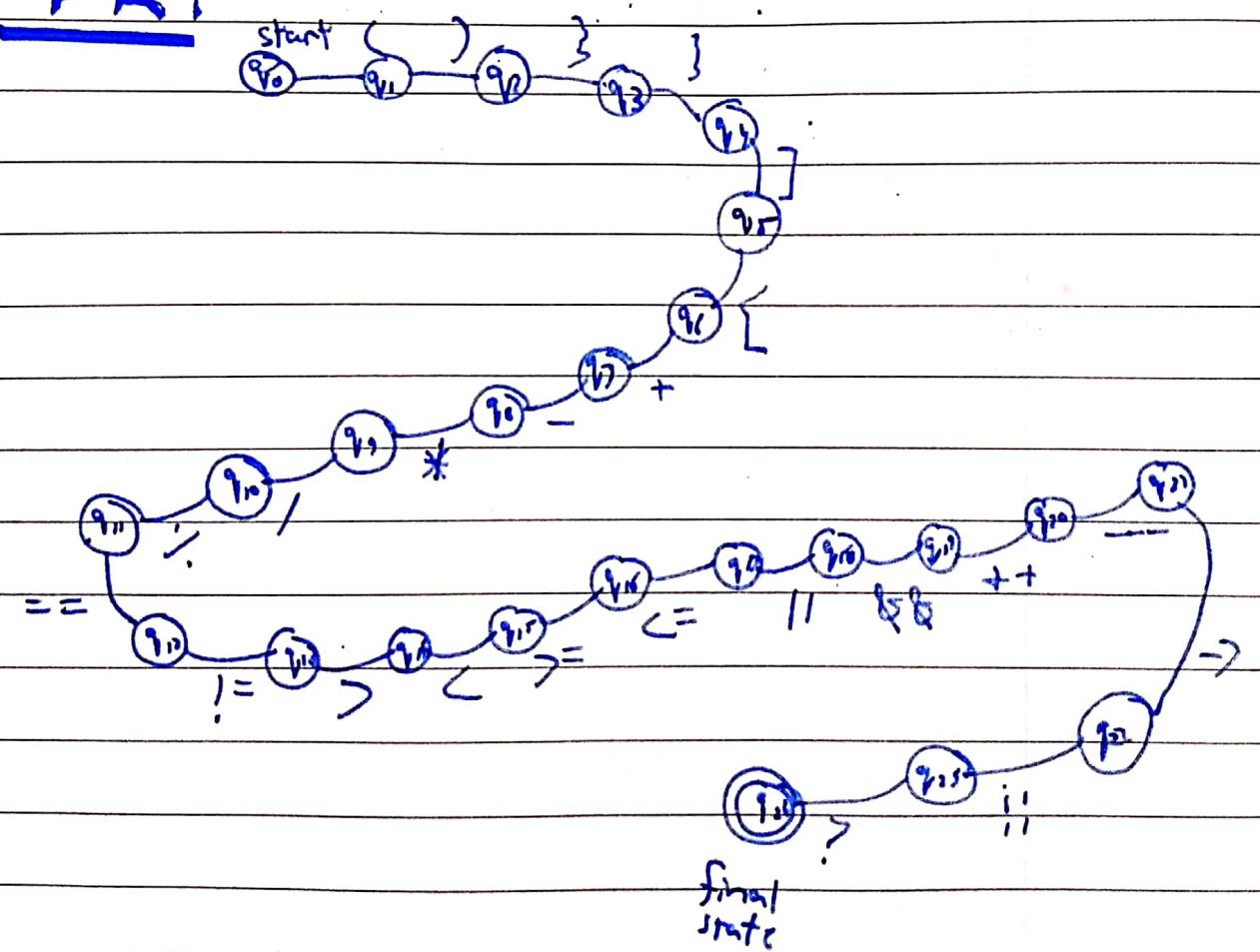
Date _____

RE: $[-+^*/\%]=<> = ? | \backslash | \backslash | \& \& | \mid + | + | - | -$
 $\rightarrow | ; | \backslash ?$

CFG:

$\langle \text{Operators} \rangle \rightarrow "+ | - | * | / | / | = | = |$
 $> | < | > = | < = | / / | \& \& | \div + |$
 $- | \rightarrow | ; | ? |) | (| \{ | \}$

FA:



Function

Date _____

RE: $r' \mid b \text{ function} \mid s + (\mid s^* + [A-Z \cup a-z 0-9] \mid s^* \\ + - \mid s^* + [A-Z \cup a-z 0-9] \mid b \mid s^* + s')$

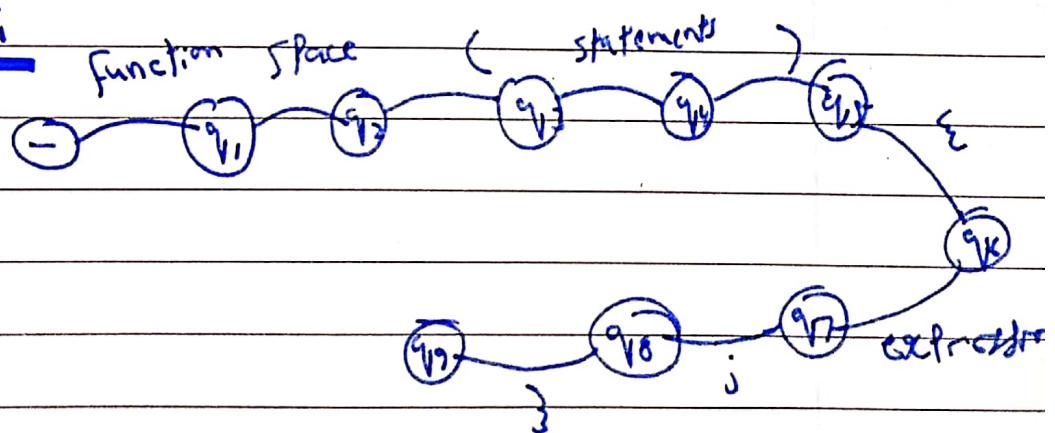
CFG:

$\langle \text{function} \rangle \rightarrow \text{'function'} \langle \text{Space} \rangle (\langle \text{statement} \rangle ;)$
 $\{ \langle \text{statement} \rangle \}$

$\langle \text{statement} \rangle \rightarrow \langle \text{datatype} \rangle \langle \text{identifier} \rangle$
 $\mid \langle \text{datatype} \rangle \langle \text{id} \rangle$
 $\langle \text{assign_opt} \rangle \langle \text{value} \rangle$

$\langle \text{statement} \rangle \rightarrow \langle \text{single_line} \rangle \mid \langle \text{mul_line} \rangle \mid \langle \text{value} \rangle$
 $\langle \text{attribute} \rangle \mid \langle \text{condition} \rangle \mid \langle \text{loop} \rangle \mid$
 $\langle \text{func_call} \rangle \mid \langle \text{object} \rangle$

FA:



Function Call

Date _____

REi : $r' \mid b[A-Za-z]b^*s^* (\mid \dots \mid b^*s^*)^*$

CFGi

$\langle \text{function-call} \rangle \rightarrow \langle \text{function-name} \rangle \langle \text{space} \rangle$

$\langle (\langle \text{parameters} \rangle) \rangle$

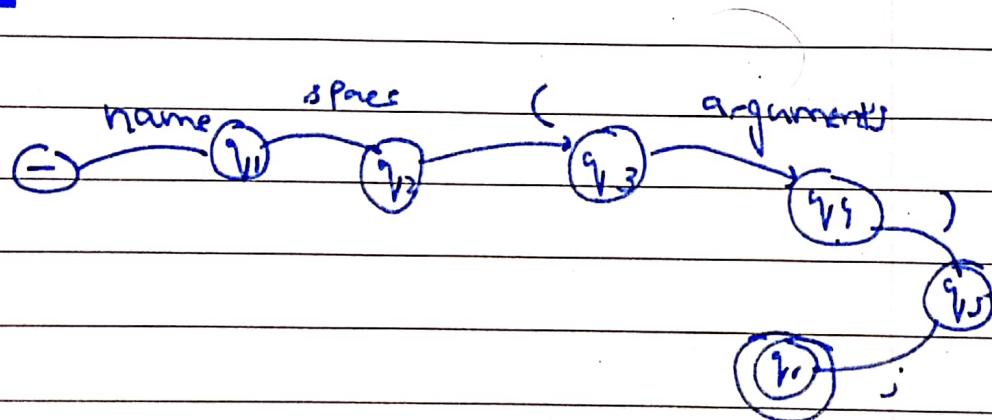
$\langle \text{function-name} \rangle \rightarrow \langle \text{valid-name} \rangle$

$\langle \text{valid-name} \rangle \rightarrow \langle \text{letter} \rangle \langle \text{identifier-tail} \rangle$

$\langle \text{identifier-tail} \rangle \rightarrow \langle \text{letter-or-digit} \rangle \langle \text{identifier-tail} \rangle$

$\langle \text{Parameters} \rangle \rightarrow \langle \text{value} \rangle \mid \langle \text{assign operator} \rangle$

FAi

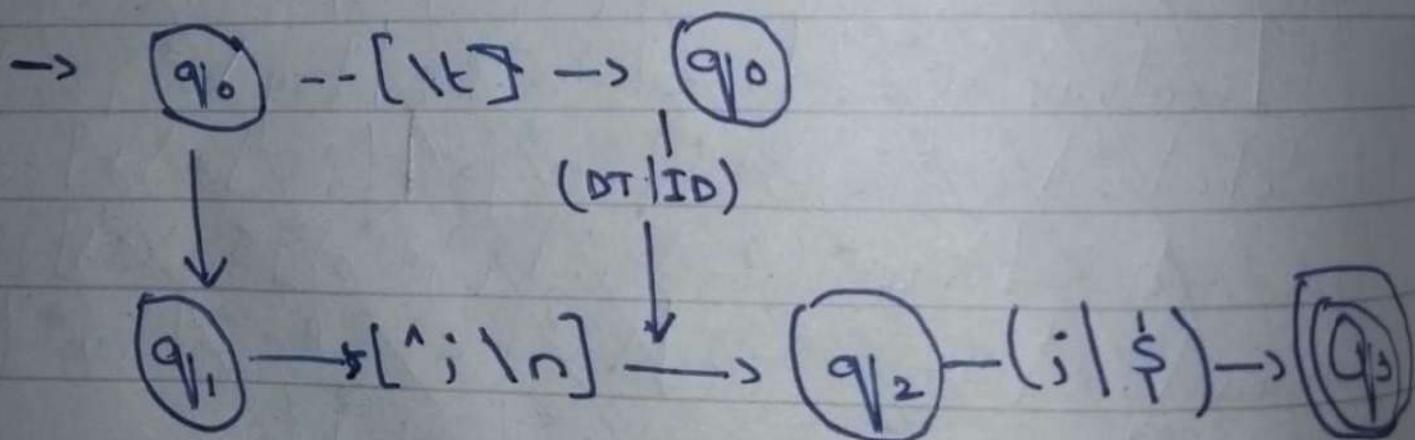


Name: Muhammad Shehroz
Seat no: B20103052

SINGLE LINE STATEMENT:
(SST)

R.E: $1s^* (?: DT | ID) [^; \backslash n]^* (?: ; | \backslash \frac{1}{2})$

FA for SST:



CFG₁ (CONTEXT-FREE GRAMMER)

$\langle \text{SST} \rangle \rightarrow \langle \text{For_st} \rangle \mid \langle \text{IF_st} \rangle \mid \langle \text{While_st} \rangle$
 $\mid \langle \text{Return_st} \rangle \mid \langle \text{Continue} \rangle \mid \langle \text{Break} \rangle$
 $\mid \langle \text{Try_st} \rangle \mid \text{inc_dec} \langle \text{SP}' \rangle \mid \text{ID} \langle \text{Ref} \rangle$
 $\mid \text{throw} \langle \text{Throw}' \rangle \mid \langle \text{SP} \rangle \mid \text{ID} \langle \text{Ref} \rangle$
 $\mid \langle \text{Assign OP} \rangle \langle \text{Exp} \rangle ; \mid \text{DT} \langle \text{N_Dec} \rangle$
 $\mid \text{dic} \langle \text{Multi_Arr} \rangle \mid \text{ID} \langle \text{SST_ID} \rangle$

$\langle \text{SST_ID} \rangle \rightarrow \text{ID} \langle \text{Object}' \rangle$
 $\rightarrow \langle \text{SST_ID}' \rangle$

$\langle \text{SST_ID}' \rangle \rightarrow \cdot \text{ID} \langle \text{SST_ID}' \rangle$
 $\rightarrow [\langle \text{Exp} \rangle] \langle \text{SST_ID}' \rangle$
 $\rightarrow (\langle \text{PL} \rangle) \langle \text{SST_ID}' \rangle$
 $\rightarrow \text{inc_dec};$
 $\rightarrow \langle \text{Assign OP} \rangle \langle \text{Exp} \rangle ;$

$\langle \text{SST_1} \rangle \rightarrow \cdot \text{ID} \langle \text{SST_ID}' \rangle$
 $\rightarrow \text{inc_dec};$
 $\rightarrow \langle \text{Assign OP} \rangle \langle \text{Exp} \rangle ;$
 $\rightarrow \text{j}$

$\langle \text{SST_2} \rangle \rightarrow \text{j}$
 $\rightarrow \cdot \text{ID} \langle \text{SST_ID}' \rangle$

Multiline statement: (MST)

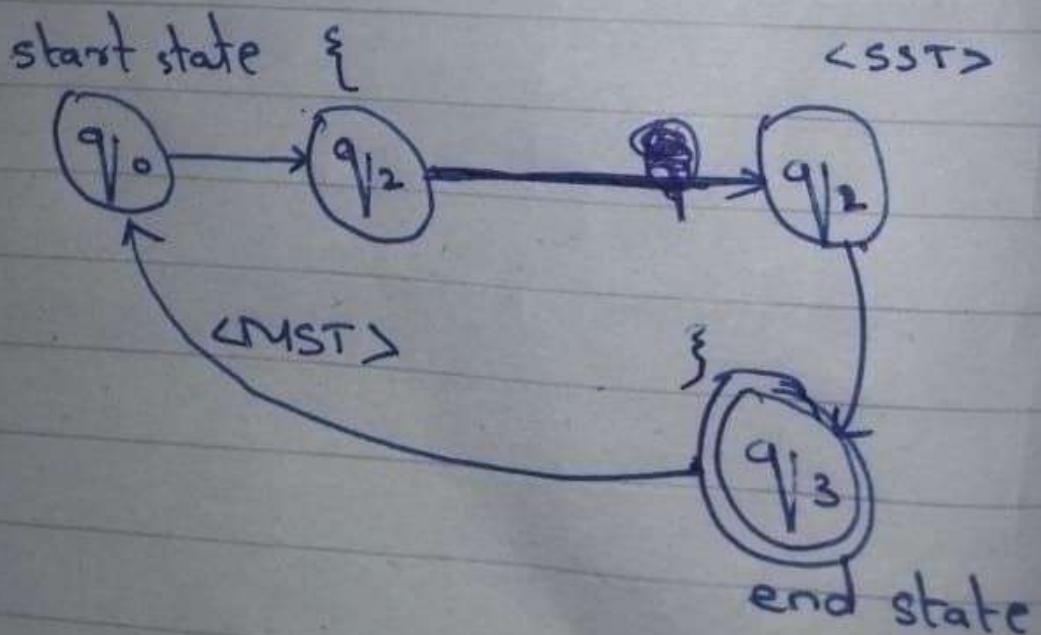
R.E:

$$\{(\langle \text{SST} \rangle (\langle \text{SST} \rangle \mid \epsilon))^*\}$$

CFG:

$$\langle \text{Body MST} \rangle \rightarrow \{ \langle \text{MST} \rangle \}$$
$$\begin{aligned} \langle \text{MST} \rangle &\rightarrow \langle \text{SST} \rangle \langle \text{MST} \rangle \\ &\rightarrow \$ \text{ (end line)} \end{aligned}$$

FA:



EXCEPTION HANDLING · (Try, catch, Finally)

R.E.:

$$\backslash s^* (\text{try}) \backslash s+ (\{ \{ \cdot \ast \} \} \backslash W^+) \backslash s^* (\text{catch} \backslash s+ \\ (\backslash W^+ \backslash s+ \backslash w+ \backslash) \backslash s+ \{ \{ \cdot \ast \} \}) ? | \\ (\text{finally} \backslash s+ \{ \{ \cdot \ast \} \})) ?$$

CFG:

$\langle \text{Try-st} \rangle \rightarrow \text{try} \langle \text{Body MST} \rangle \langle \text{catch Finally} \rangle$
 $\langle \text{catch Finally} \rangle \rightarrow \langle \text{Finally} \rangle$
 $\rightarrow \langle \text{catch Finally}' \rangle$

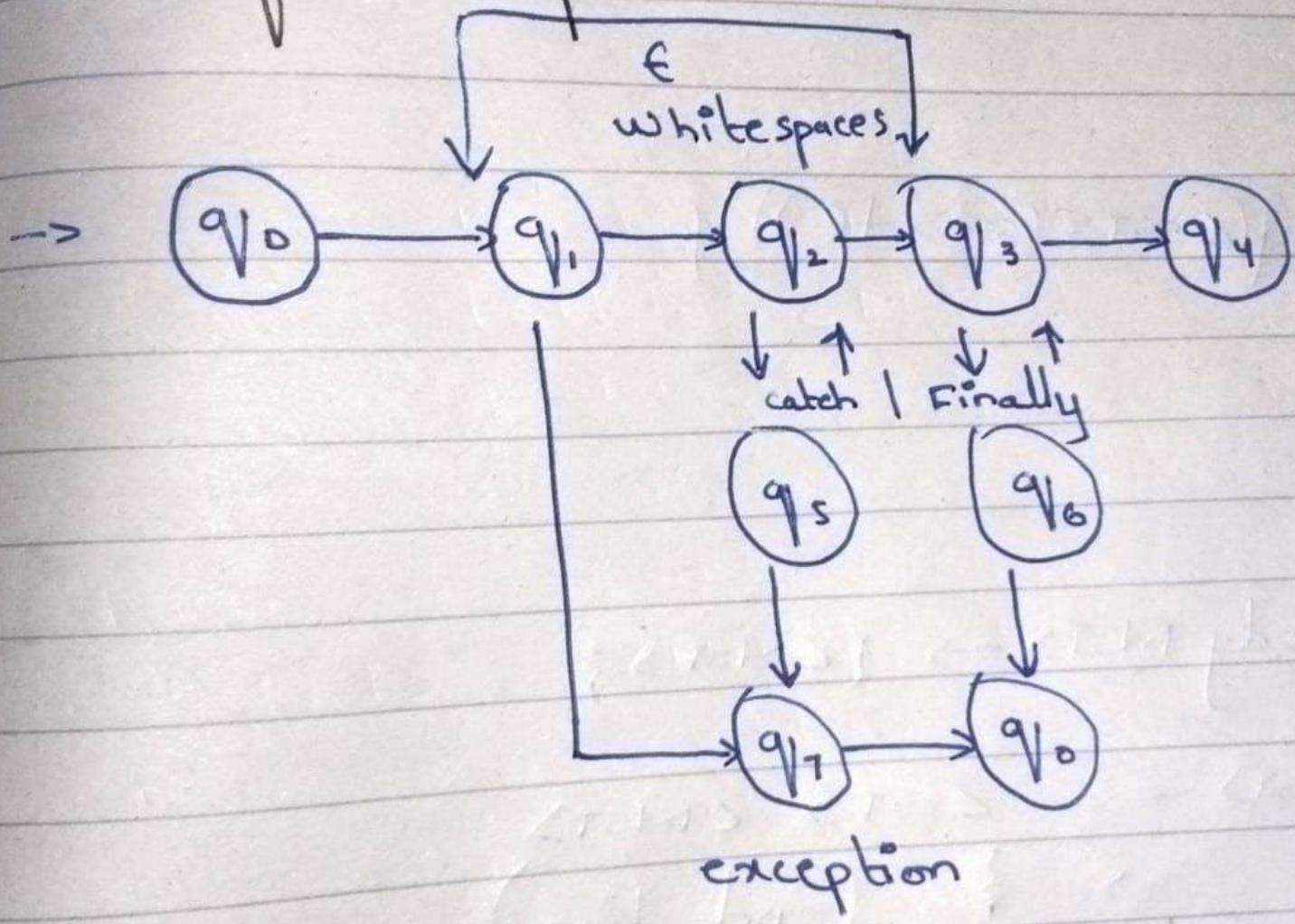
$\langle \text{Finally} \rangle \rightarrow \text{finally} \langle \text{Body MST} \rangle$
 $\langle \text{Finally}' \rangle \rightarrow \text{finally} \langle \text{Body MST} \rangle$
 $\rightarrow \downarrow$

$\langle \text{Catch} \rangle \rightarrow \text{catch} (\langle \text{Exception} \rangle \text{ID}) \langle \text{Body MST} \rangle$
 $\langle \text{Catch}' \rangle$

$\langle \text{Catch}' \rangle \rightarrow \langle \text{catch} \rangle$
 $\rightarrow \downarrow$

~~catch~~

FA for Exceptions:



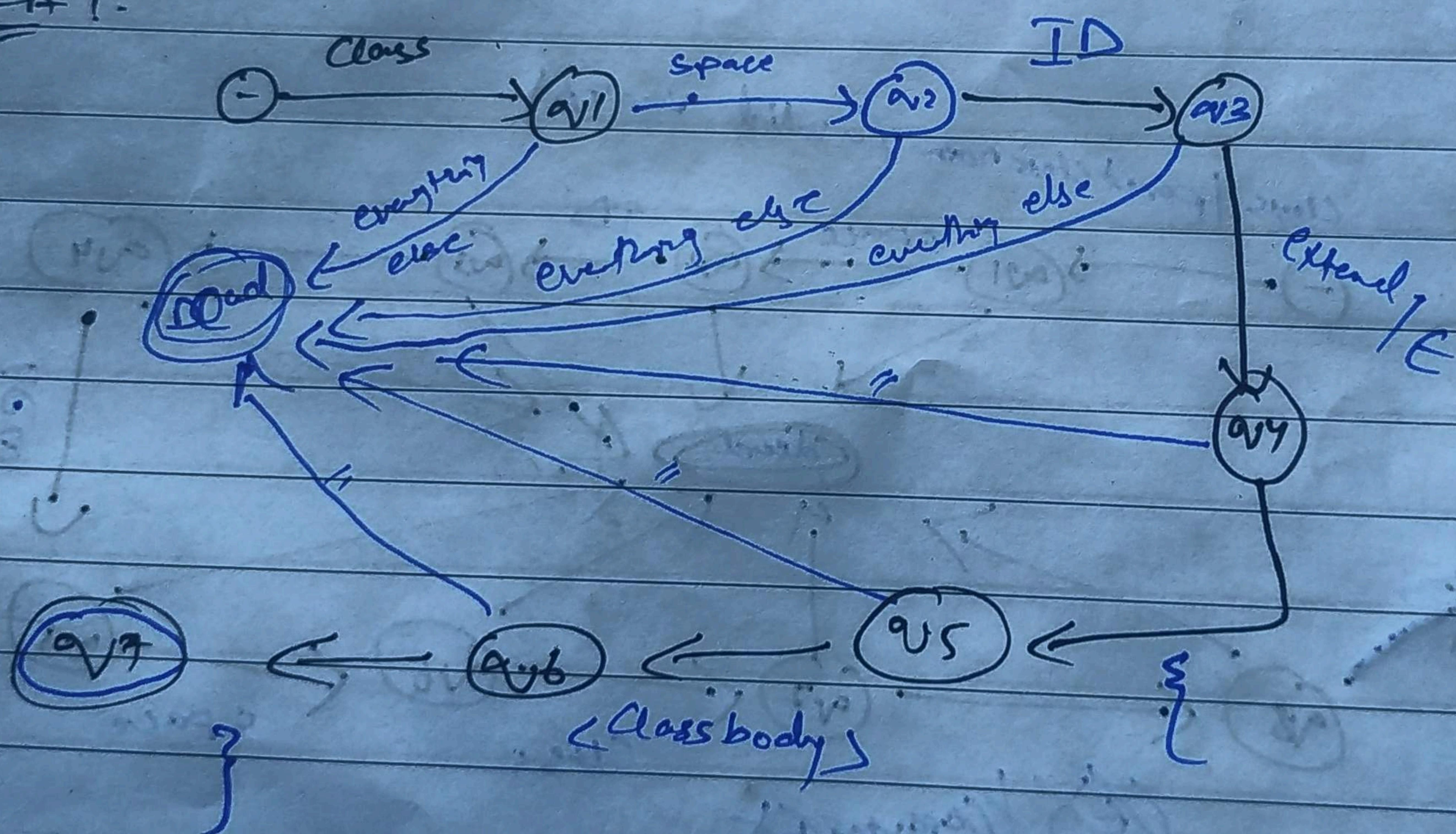
RE for OOP (class)

RE = $^* (\text{class}) \backslash s \backslash w + \{ \} : \$$

CFG for Class dec

$\langle \text{class-dec} \rangle \rightarrow \text{Class} \quad \langle \text{ID} \rangle \{ \langle \text{class-Body} \rangle \}$
 $\langle \text{extends} \rangle \rightarrow \text{extends} \mid \langle \text{class-dec} \rangle$
 $\langle \text{class-Body} \rangle \rightarrow \{ \mid \langle \text{dec} \rangle \mid \langle \text{function} \rangle$
class
extends
method
and garis diambil dari
dutera?

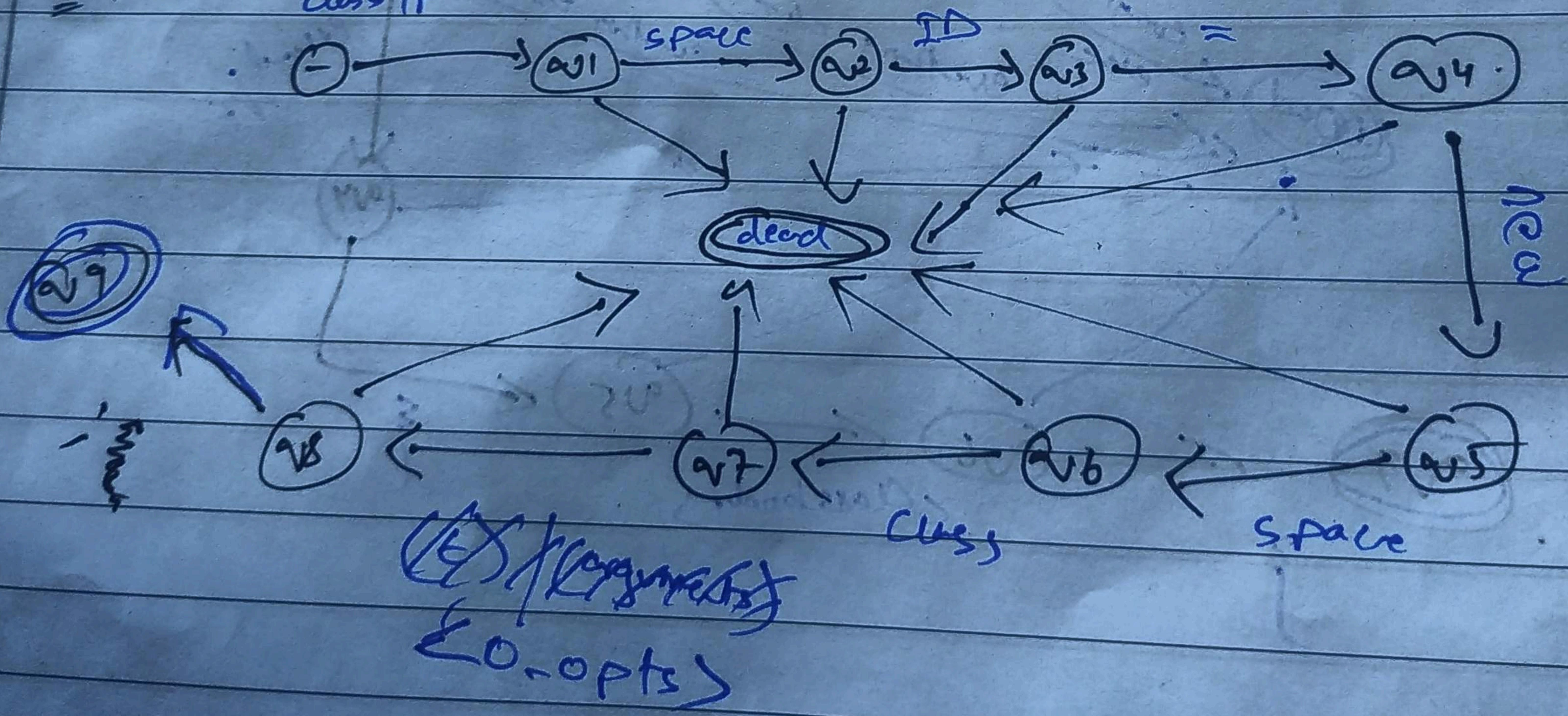
FA!



RE for oop (object)

RE: $class \{ s^* \rightarrow [A-Za-zA-Z.] \}^* = 15^* \text{ new } | s + \text{class } (.)^*$

(E07)

 $\langle \text{Obj-dec} \rangle \rightarrow \text{Class } | \text{parent class } \underset{\text{name}}{\text{name}} \langle \text{ID} \rangle \Rightarrow \text{new class } (E^*) ;$ $\langle \text{O_opts} \rangle \rightarrow = \text{new class } (E^* | \langle \text{arguments} \rangle \text{ string } \cdot \text{obj?})$ $\langle \text{O_opts} \rangle \rightarrow = \text{null } \text{ge} \rightarrow \text{askta hui}$ $\langle \text{O_opts} \rangle \rightarrow = \text{object name} \quad = \text{null} \rightarrow \text{askta hui}$ $\langle \text{O_opts} \rangle \rightarrow E$ FA 1: $\text{class } | \text{parent class name } (\text{a valid var ID})$ 

ASSIGNMENT

If-else

① RTE :-

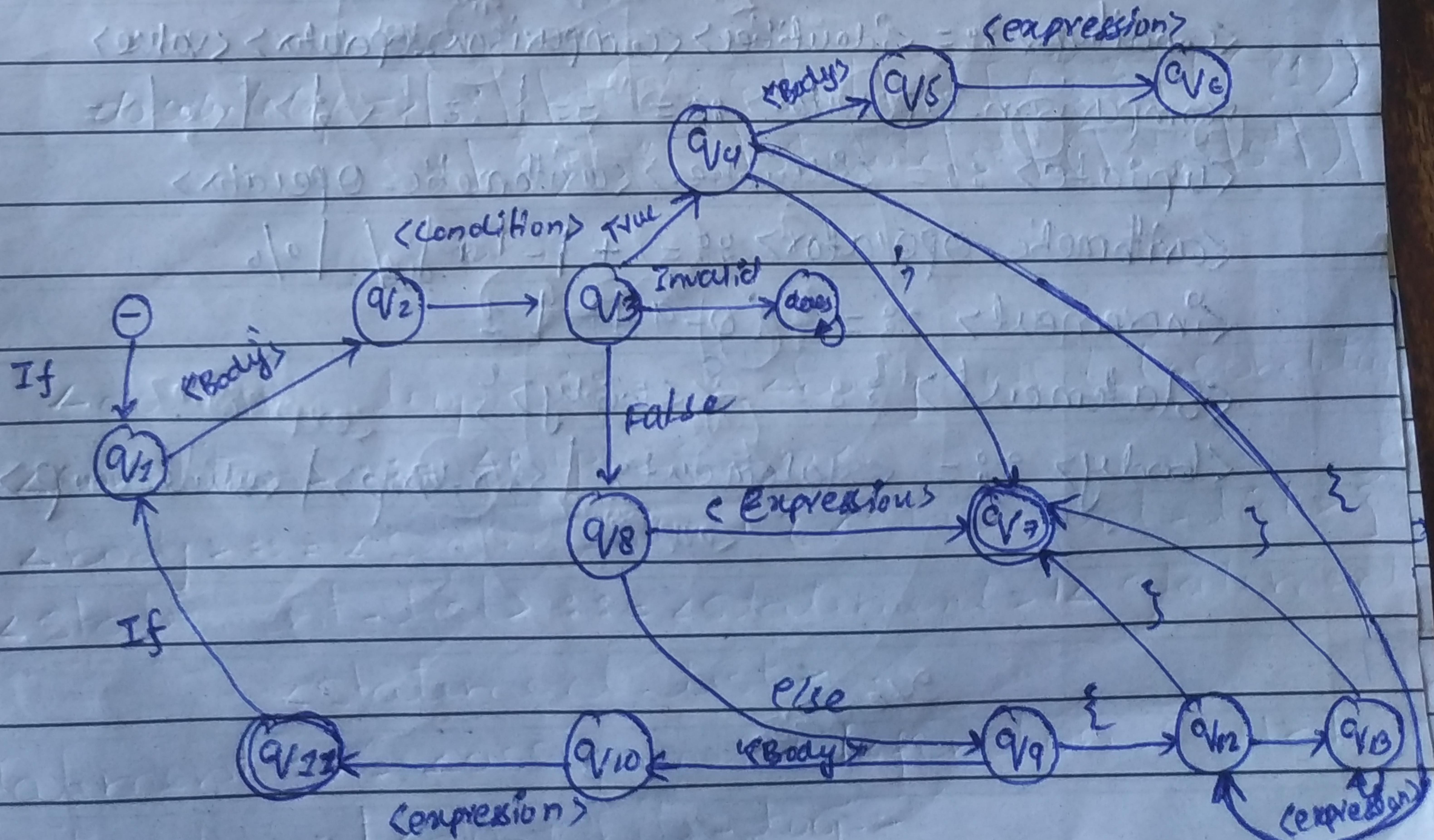
if \Rightarrow 'if' | 'else'
else \Rightarrow 'else'

② CFCIL

$\langle \text{If-st} \rangle ::= \text{If} \langle \text{exp} \rangle \langle \text{BodyMST} \rangle \langle \text{Else} \rangle$
 $\langle \text{If-st} \rangle ::= \text{'if'} \langle \text{expression} \rangle \langle \text{statement} \rangle \langle \text{else} \langle \text{statement} \rangle \rangle$
 $\langle \text{statement} \rangle ::= \langle \text{If-st} \rangle \mid \langle \text{expression-st} \rangle \mid \langle \text{return-st} \rangle \mid \langle \text{block} \rangle$
 $\langle \text{expression} \rangle ::= \langle \text{assignment-expression} \rangle \mid \langle \text{expression} \rangle , \langle \text{expression} \rangle$
 $\langle \text{conditional-expression} \rangle ::= \langle \text{logical-or-expression} \rangle \mid ? \langle \text{expression} \rangle :$
 $\langle \text{conditional-expression} \rangle$

$\langle \text{Else} \rangle ::= \text{'else'} \langle \text{space} \rangle \langle \text{statement} \rangle$

③ FAI :-



for-loop

① RE

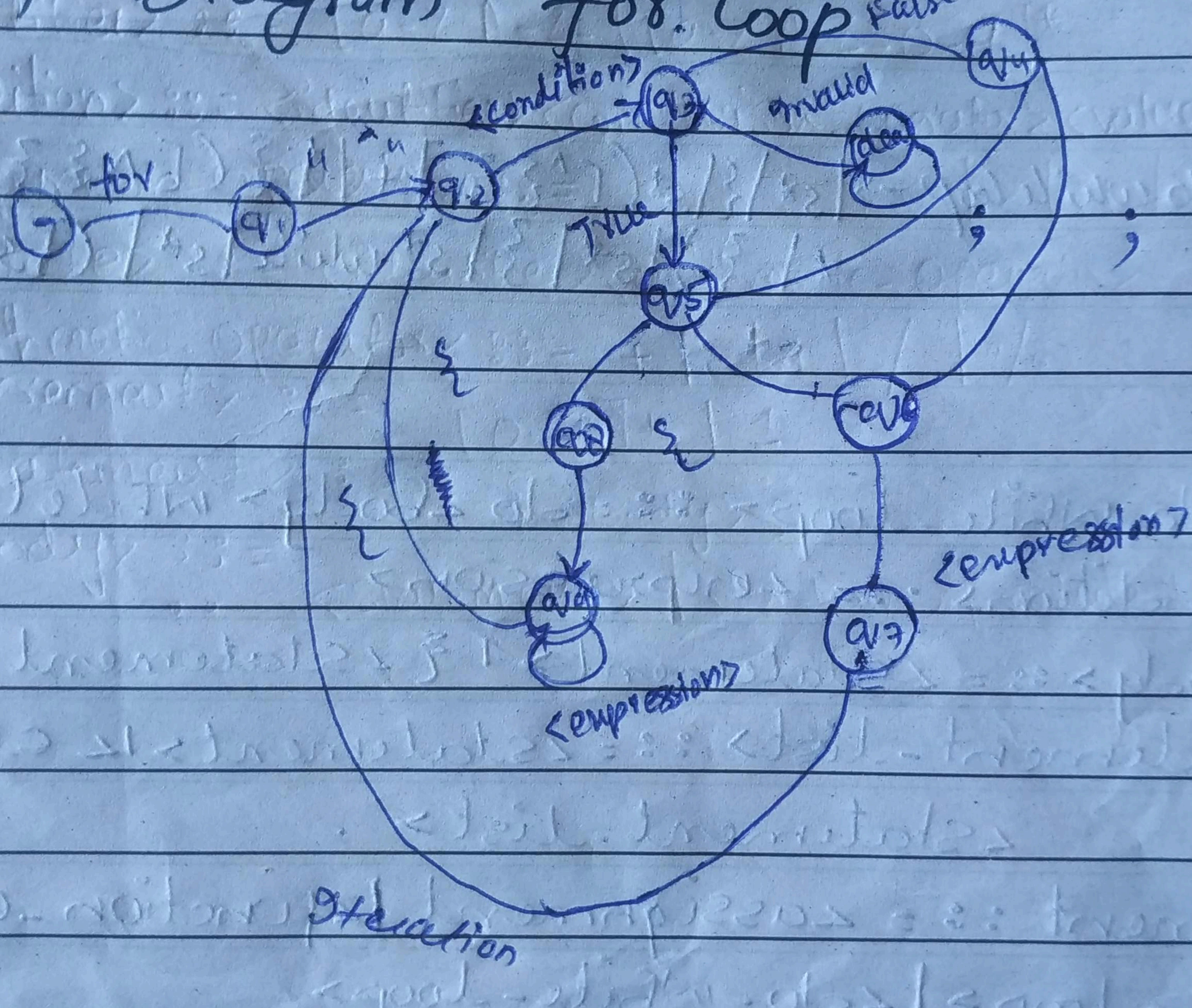
for loop $\Rightarrow \backslash s^* \mid C \mid s^* \text{ int } \mid s^* [a-zA-Z] \mid w^* \mid s^* = \mid s^* \mid d+ \mid s^*$
 $\mid s^* [a-zA-Z] \mid w^* \mid s^* \mid \mid s^* [a-zA-Z] \mid w^* \mid s^*$
 $\mid s^* [a-zA-Z] \mid w^* \mid s^* \mid + \mid + \mid s^* \mid \mid s^* \mid \{ \cdot \cdot \cdot \} \mid s^* \mid$

- .) $\mid s^* \Rightarrow$ white spaces (spaces, tabs)
- .) $\mid =$ opening parenthesis
- .) $\text{int } \mid s^* [a-zA-Z] \mid w^* \Rightarrow$ name of the loop variable (e.g. integer variable named i)
- .) $\mid s^* = \mid s^* \Rightarrow$ equal sign with whitespace
- .) $\mid d+ \mid$ one or more digits means initial value of the loop variable

② CFG

$\langle \text{for-loop} \rangle :: = \text{for} \left(\langle \text{initialization} \rangle ; \langle \text{condition} \rangle ; \langle \text{update} \rangle \right) \langle \text{statement} \rangle$
 $\langle \text{initialization} \rangle :: = \langle \text{type} \rangle \langle \text{identifier} \rangle = \langle \text{value} \rangle$
 $\langle \text{type} \rangle :: = \text{int} \mid \text{float} \mid \text{double} \mid \text{char} \mid \text{boolean} \mid \dots$
 $\langle \text{identifier} \rangle :: = [a-zA-Z][a-zA-Z-0-9]^*$
 $\langle \text{condition} \rangle :: = \langle \text{identifier} \rangle \langle \text{comparison-operator} \rangle \langle \text{value} \rangle$
 $\langle \text{comparison-operator} \rangle :: = == \mid != \mid < \mid > \mid \leq \mid \geq$
 $\langle \text{update} \rangle :: = \langle \text{identifier} \rangle \langle \text{arithmetic-operator} \rangle$
 $\langle \text{arithmetic-operator} \rangle :: = + \mid - \mid * \mid / \mid \%$
 $\langle \text{increment} \rangle :: = [0-9] + \mid 1$
 $\langle \text{statement} \rangle :: = \{ \langle \text{body} \rangle \}$
 $\langle \text{body} \rangle :: = \langle \text{statement} \rangle \mid \langle \text{for-loop} \rangle \mid \langle \text{while-loop} \rangle \mid \dots$

$x - x - \alpha$



Rainbow

Teacher's Sign.

White-Loop

Date _____

① RE:

whiteLoop \Rightarrow $Is^* | (Is^* | w + (s^* | s^* | \{ Is^* \} | s^* | \{ Is^* \}^* | ?) |$

• $| w +$ \Rightarrow one or more word characters like (variable name or boolean expression)

• $[Is | S]^* | ? \Rightarrow$ loop body

② CFG:

$\langle \text{while-loop} \rangle ::= \text{while } \langle \text{condition} \rangle \langle \text{statement} \rangle$

$\langle \text{condition} \rangle ::= \langle \text{identifier} \rangle \langle \text{comparison-operator} \rangle \langle \text{value} \rangle$

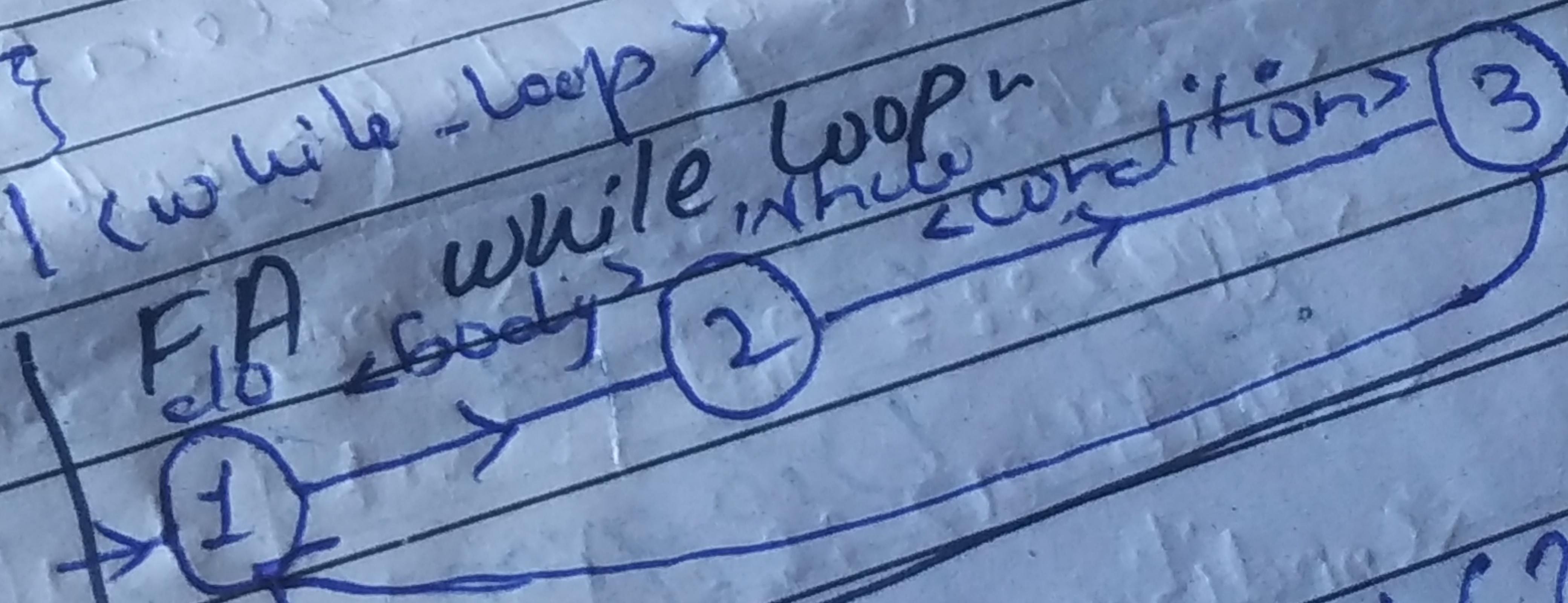
$\langle \text{comparison-operator} \rangle ::= [z= | != | < | > | \leq | \geq]^*$

$\langle \text{identifier} \rangle ::= [a-zA-Z0-9]^*$

$\langle \text{value} \rangle ::= [0-9]^* | \text{true} | \text{false} | \text{null} |$

$\langle \text{statement} \rangle ::= \{ \langle \text{body} \rangle \}$

$\langle \text{body} \rangle ::= \langle \text{statement} \rangle | \langle \text{while-loop} \rangle$



12
1371(?)