

## Computer Science Language Processors

### Rules

- The duration of the test is **30 minutes**
- Questions will not be answered during the test
- One cannot re-enter the classroom after leaving it
- The answers must be written using a pen (not a pencil)

### 1.- Find a regular expression corresponding to the language of strings of even lengths over the alphabet of {a, b}.

Since any string of even length can be expressed as the concatenation of strings of length 2 and since the strings of length 2 are aa, ab, ba, bb, a regular expression corresponding to the language is  $(aa \mid ab \mid ba \mid bb)^*$ . Note that 0 is an even number. Hence the string  $\lambda$  is in this language.

### 2.- Given the following grammar that defines a language for a specific processor

```

program    → functions main
           | main
functions  → functions function
           | function
function   → 'function' ident '(' block
main       → 'main' block
block      → '{' sentences '}'
sentences  → sentences sentence
           | sentence
sentence   → ident '=' expression ';'
           | block
expression → expression '[' ident ']' ident
           | expression '?' ident ':' ident
           | expression '+' const
           | '*' expression
           | '&' expression
           | ident
           | '[' ident ']'
           | const
ident      → ident letter
           | letter
letter     → 'a' | 'b' | ... | 'z'
const      → num '.' num
num        → '0' | '1' | ... | '9'

```

Obtain the table of tokens with the maximum abstraction level for the complete process of translation.

Number	Token	Pattern	Attributes
...		...	...

The table of tokens with the maximum level of abstraction when performing the complete translation process is the following:

Number	Token	Pattern	Attributes
1	FUNCTION	"function"	...
2	PROGRAM	"program"	...
3	BEGIN	"begin"	...
4	END	"end"	
5	PCOMA	","	
6	ASIG	"="	
7	OP_MI_MAS	">=" "+"	>=, +
8	OP_AST_AMP	"*" "&"	*, &
9	CLEFT	"["	
10	CRIGHT	"]"	
11	IDENT	"[a-z]+"	
12	CONST		"[0-9]+"