Exámenes

Self-Assessment Test Theme 2

Volver a la Lista de Examenes

Parte 1 de 3 - Second 2.0/ 2.0 Puntos

Preguntas 1 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

The following BNF grammar defines the syntax of a programming language:

<Bool> ::= True | False

<Num> ::=0|1|2|3

<Inst> ::= skip | if <Bool> then <Num> else <Num> | Inst ; Inst

Which of the following expressions is legal (i.e., it can be generated using the previous grammar)?

- A. if True then 2 else 4;
- B. if True then 2
- C. if 1 then 2 else 4
- D. if True then 1 else 2

Preguntas 2 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Which of the following statements is false?

- A.
  A lexical analyzer (scanner) is a program that splits a string (the program) in a sequence of primitive syntactic components or tokens.
- B. The dynamic semantics of the language is checked during one of the compilation phases
- C. A parser is a program that recognizes a sequence of tokens and builds a sequence of instructions.
- D. A semantic analyzer is a program that checks the static semantics of language.

Parte 2 de 3 - First 2.67/ 3.5 Puntos

Preguntas 3 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Two programs **P1** and **P2** are *equivalent* (**P1 ≈ P2**) if they have the same semantics. Considering the *big step* operational semantics as a basis to define such an equivalence, which of the following equivalence statements is **TRUE**?

- A. (x:= 5; while x>2 do x:= x-1) ≈ (x:= 1; x:= x+x)
- B. (P1 ≈ P2), siendo

```
P1:  x := 0; y := 2;
     if false then x:= y else y:= x;
     x := y;

P2:  x := 0; y := 2;
     if false then x := y else {y := x; x := y};
```

- C. (x := 1; while x < 2 do x:= x + 3) ≈ (x := 1)
- D. (x:=1; y:=3; if x <= y then x:=0 else x:=1) ≈ (x:=1; y:=3)

Preguntas 4 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Consider the following program *S*:

```
x := 0;
y := -1;
if x > 0 then y := 1 else x := 0;
```

and the specification given by the precondition P=*true* and postcondition Q = (y > 0). Which of the following claims is **TRUE**?

- A. No initial state satisfies the precondition P.
- B.
  The program does **NOT** satisfy the specification, that is, there is an initial state that satisfies the precondition but the final state which is obtained after executing the program does not satisfy the postcondition.
- C. Starting from any initial state, the postcondition Q will always be true on the obtained final state.
- D. The final values of variables x and y depend on their values in the initial state.

Preguntas 5 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which is the most appropriate semantic style for program verification?

- A. Small-step operational semantics.
- B. Small-step operational semantics.
- C. Axiomatic semantics.
- D. Denotational semantics.

Preguntas 6 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which of the following statements concerning the semantics of programming languages is false?

- A.
  In the operational semantics the meaning of the instructions may be done in two ways: small-step and big-step.
- B. The axiomatic semantics is used in some techniques for verifying imperative programs.
- C.
  The operational semantics is adequate to describe the meaning of all kinds of programming languages, including declarative ones.
- D. The axiomatic semantics is a kind of operational semantics.

Preguntas 7 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given the transition rules for the *small step* operational semantics of the **while** command:

$$\frac{\langle b,\ e\rangle \Rightarrow \text{false}}{\langle \text{while } b \text{ do } i,\ e\rangle \rightarrow \langle \text{skip},\ e\rangle}$$

$$\frac{\langle b,\ e\rangle \Rightarrow \text{true}}{\langle \text{while } b \text{ do } i,\ e\rangle \rightarrow \langle (i;\ \text{while } b \text{ do } i),\ e\rangle}$$

which is the configuration that follows to $\langle \text{while } X<4 \text{ do } X:=X+1, \{X \mapsto 3\}\rangle$?

- A. $\langle \text{skip}, \{X \mapsto 4\}\rangle$
- B. $\langle \text{skip}, \{X \mapsto 3\}\rangle$
- C. $\langle X:=X+1, \text{while } X<4 \text{ do } X:=X+1, \{X \mapsto 3\}\rangle$
- D. $\langle X:=X+1, \text{while } X<4 \text{ do } X:=X+1, \{X \mapsto 4\}\rangle$

Preguntas 8 de 10

-0.33/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which is the function of the dynamic semantics?

- ○ A. Detect errors related to the syntax of the language.
- ○ B. Document the code.
- ◯ C. The same as the static semantics but the dynamic semantics checks things during execution time.
- ○ D. Study the behaviour of the programs during execution.

Preguntas 9 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

If we say that "the meaning of a language instruction i is expressed in terms of the actions taken by an abstract machine to execute it", we are defining the:

- ○ A. axiomatic semantics
- ◯ B. operational semantics
- ○ C. static semantics
- ○ D. none of the previous.

Parte 3 de 3 - Third 1.0/ 1.0 Puntos

Preguntas 10 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Which is the main advantage of compilers with respect to interpreters?

- ◯ A. The execution of compiled programs is faster than the execution of interpreted programs.
- ○ B. Program development and debugging is easier.
- ○ C. There is no advantage: interpreters do it better.
- ○ D. The generated code is more compact than the original program but slower than the interpreted program.

Exámenes

Self-Assessment Test Theme 2

Volver a la Lista de Examenes

Parte 1 de 3 - Second 2.0/ 2.0 Puntos

Preguntas 1 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Which of the following actions are performed in the semantic analysis phase during the compilation of a program?

- A. Splitting the sequence of characters of the program into words or tokens.
- B.
  Checking the coincidence of the number of arguments in a call with the formal parameters of the routine or function that is invoked.
- C. Creating the symbol table.
- D. Linking of the object code with the code resulting from other compilations.

Preguntas 2 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Which of the following statements is false?

- A.
  A lexical analyzer (scanner) is a program that splits a string (the program) in a sequence of primitive syntactic components or tokens.
- B. The dynamic semantics of the language is checked during one of the compilation phases
- C. A parser is a program that recognizes a sequence of tokens and builds a sequence of instructions.
- D. A semantic analyzer is a program that checks the static semantics of language.

Parte 2 de 3 - First 2.67/ 3.5 Puntos

Preguntas 3 de 10

-0.33/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Fill the gap in the following inference rule

$$\frac{\quad ? \quad}{\langle \text{if } b \text{ then } c \text{ else } c', e\rangle \rightarrow \langle c', e\rangle}$$

so that we obtain one of the rules of the small-step operational semantics of IMP:

- A. $\langle b, e\rangle \rightarrow \langle \text{false}, e\rangle$
- B. $\langle b, e\rangle \Rightarrow \text{false}$
- C. $\langle b, e\rangle \Rightarrow \text{true}$
- D. $\langle c, e\rangle \rightarrow \langle c', e\rangle$

Preguntas 4 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given the following code:

```
{P}
X:=X-1;
Y:=X;
{Q} = {Y>0}
```

and using the axiomatic semantics, which of the following values for the precondition P leads to conclude that the program is correct?

- A. X>Y
- B. X=100
- C. X
- D. X>0

Preguntas 5 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which of the following statements concerning the semantics of programming languages is false?

- A.
  In the operational semantics the meaning of the instructions may be done in two ways: small-step and big-step.
- B. The axiomatic semantics is used in some techniques for verifying imperative programs.
- C.
  The operational semantics is adequate to describe the meaning of all kinds of programming languages, including declarative ones.
- D. The axiomatic semantics is a kind of operational semantics.

Preguntas 6 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

The small-step operational semantics for IMP can be described as:

- A. A relation on program states.
- B. A relation on configurations, i.e., pairs consisting of an instruction and a program state.
- C. A relation between arithmetic expressions and integer values.
- D. A relation between programs and logical assertions.

Preguntas 7 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given a semantics S for a programming language, we say that two programs **i1** and **i2** are equivalent (written **i1 ≈ i2**) if they have the same semantics. If we consider the *big step* operational semantics for SIMP, which of the following program equivalence statements is **WRONG**?

- A. (x:=y; y:=x) ≈ x:=y
- B. (y:=y) ≈ skip

  (donde skip es la instrucción vacía)
- C. (x:=y; y:=x) ≈ (y:=x; x:=y)
- D. (if x >= 0 then x:= x-x else x:=x*0) ≈ x:=0

Preguntas 8 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which of the following aspects of a programming language is appropriate as a basis for building automatic tools to analyze the equivalence of programs?

- ○ A. Its generative grammar.
- ○ B. Its compiler.
- ○ C. Its parser.
- ○ D. Its semantics.

Preguntas 9 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Consider the following definitions for the weakest precondition calculus:

wp(X:= exp, Q) = Q[X ↦ exp]

wp(i1;i2, Q) = wp(i1, wp(i2, Q))

Which is the outcome of wp((X:=X+1;Y:=Y-1; X:=X+Y'), X>0) ?

- ○ A. $X>0 \wedge Y>0$
- ○ B. $X+Y>0$
- ○ C. $X+Y>=0$
- ○ D. $X>=0 \wedge Y>=0$

Parte 3 de 3 - Third

1.0/ 1.0 Puntos

Preguntas 10 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Which of the following statements is FALSE:

- ○ A. Interpreters give better support for debugging than compilers.
- ○ B. Interpreters generate object code smaller than compilers.
- ○ C. Compilers generally produce more efficient programs.
- ○ D. Java, Pascal and Prolog are three languages with mix implementation.

Exámenes

Self-Assessment Test Theme 2

Volver a la Lista de Examenes

Parte 1 de 3 - Second 0.67/ 2.0 Puntos

Preguntas 1 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Which of the following statements is TRUE?

- A. The static semantics analyzes the most stable part of the code.
- B. Errors due to type incompatibilities are detected during the semantic analysis.
- C. Syntactic errors in programs are detected during the linking phase.
- D.
  The static semantics detects all errors in compilation time; hence the dynamic semantics is executed with no error.

Preguntas 2 de 10

-0.33/ 1.0 Puntos. Puntos descontados por fallo: 0.33

The following BNF rules define a grammar G:

```
<decl>::= <tipo> <ident> {,<ident>}

<tipo>::= int|float|char

<ident> = <letra> <letra>*

<letra> = a | .. | z | A | .. | Z
```

Which of the following sentences is legal in the language defined by G?

- A. `int a = 1`
- B. `float esta, y, aquella`
- C. `char a1, a2, a3`
- D. `double esta = 1.5`

Parte 2 de 3 - First 2.67/ 3.5 Puntos

Preguntas 3 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which configuration is required (in *) to make the following evaluation complete by using the small-step operational semantics?

⟨if X>Y then Y:=Y+X else Y:=0, {X ↦→ 42, Y ↦ 0}⟩
⟨X>Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ true
⟨X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
⟨Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ 0
→ ⟨Y:=Y+X, {X ↦ 42, Y ↦ 0}⟩
⟨Y+X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
⟨Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ 0
⟨X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
→ (*

- ○ A. ⟨ Y:=0, {X ↦ 42, Y ↦ 0} ⟩
- ○ B. ⟨ skip, {X↦ 42, Y ↦ 0} ⟩
- ○ C. ⟨ if X>Y then Y:=Y+X else Y:=0, {X ↦ 42, Y ↦ 0} ⟩
- ○ D. ⟨ skip, {X ↦ 42, Y ↦ 42} ⟩

Preguntas 4 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given the axiomatic definition of the conditional instruction

pmd(if B then i1 else i2, Q) = (B ^ pmd(i1, Q)) v (not(B) ^ pmd(i2, Q))

and {Q}={y=4}, which is the weakest precondition for the following program?:

if x>=0
then y:=x
else y:=-x

- ○ A. (x = 4) ∨ (x = -4)
- ○ B. (x = 4) ∧ (x = -4)
- ○ C. x = 4
- ○ D. x = -4

Preguntas 5 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Consider the following program *S*:

```
x := 0;
y := -1;
if x > 0 then y := 1 else x := 0;
```

and the specification given by the precondition P= *true* and postcondition Q = (y > 0). Which of the following claims is **TRUE**?

- A. No initial state satisfies the precondition P.
- B.
  The program does **NOT** satisfy the specification, that is, there is an initial state that satisfies the precondition but the final state which is obtained after executing the program does not satisfy the postcondition.
- C. Starting from any initial state, the postcondition Q will always be true on the obtained final state.
- D. The final values of variables x and y depend on their values in the initial state.

Preguntas 6 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which of the following statements concerning the semantics of programming languages is false?

- A. Semantics is a key tool to make comparisons between different programs.
- B. The semantics description of a program is unnecessary if the language syntax is defined formally.
- C. The operational semantics of a language is part of its dynamic semantics.
- D.
  The semantics of a programming language is the basis to develop advanced tools of program development in that language.

Preguntas 7 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given the following axiomatic definition of the assignment operation and the if-then-else operation

wp(X := exp, Q) = Q[X ↦ exp]
wp(if B then i1 else i2, Q) = (B ^ wp(i1, Q)) v (not(B) ^ wp(i2, Q))

which of the following expressions is the weakest precondition P of the following program with respect to the postcondition Q:

{P}={?}
if x=0
  then y:= 2*x
  else y:= x+y
{Q}={x=0}

- A. P = (x = 0)
- B. P = (y = 0)
- C. P = (x = 0 ∧ y=0)
- D. P = (x = 0 ∧ y=0) v (x ≠ 0 ∧ y≠0)

Preguntas 8 de 10

-0.33/ 0.5 Puntos. Puntos descontados por fallo: 0.33

According to the following rules, what does the 3-ary operator *a0 = b = a1* do, where *a0* and *a1* are arithmetic expressions, and *b* a boolean expression?

$$\frac{\langle b,e\rangle \Rightarrow true \quad \langle a0,e\rangle \Rightarrow n0}{\langle a0 = b = a1,e\rangle \Rightarrow n0} \qquad \frac{\langle b,e\rangle \Rightarrow false \quad \langle a1,e\rangle \Rightarrow n1}{\langle a0 = b = a1,e\rangle \Rightarrow n1}$$

- A. It returns *true* if condition *b* holds, and *false* otherwise.
- B. Command *a0* is executed if *b* is true, and *a1 is executed otherwise*.
- C. It returns the addition of the arithmetic expressions *a0* and *a1*.
- D. It returns the value of *a0* if *b* holds, and the value of *a1 otherwise*.

Preguntas 9 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given the following fragment of a program, in which the assertion Q is a predicate that stands for the postcondition:

x := z
{Q} = {x = X}

according to the axiomatic semantics, point out which of the following options corresponds to the weakest precondition of the instruction in this program and Q, ie

- A. x = X
- B. z = Z
- C. z = X
- D. x = z

Parte 3 de 3 - Third 1.0/ 1.0 Puntos

Preguntas 10 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Given a program P and a program-specification P_E, which of the following claims is **WRONG**?

- A. The semantics of P and P_E is helpful to verify whether P is a correct (and complete) implementation of P_E.
- B.
  If the semantics of P and P_E coincide, then we can say that P is a correct and complete implementation of the specification P_E.
- C. If the semantics of P and P_E coincide, this means that P and P_E are syntactically equal.
- D. Two syntactically different programs P and P_E may have the same semantics.

LTP > Exámenes

Exámenes

Self-Assessment Test Theme 2

Volver a la Lista de Examenes

Parte 1 de 3 - Second 2.0/ 2.0 Puntos

Preguntas 1 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Given a *wrong* program sentence like:

```
if (x>0) else x:=x+1 then x:=x-1
```

which of the compiling phases detects its incorrectness?

- A. Lexical analysis.
- B. Syntactic analysis.
- C. Semantic analysis.
- D. Static analysis.

Preguntas 2 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Which of the following statements is TRUE?

- A. The static semantics analyzes the most stable part of the code.
- B. Errors due to type incompatibilities are detected during the semantic analysis.
- C. Syntactic errors in programs are detected during the linking phase.
- D.
  The static semantics detects all errors in compilation time; hence the dynamic semantics is executed with no error.

Parte 2 de 3 - First 1.84/ 3.5 Puntos

Preguntas 3 de 10

-0.33/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given a Hoare triple {P} S {Q}:

- ◯ A. P and Q are programs and S is a machine state.
- ◯ B. P is called the precondition, Q the postcondition, and P ⇒ Q always holds.
- ◯ C. The correctness of the triple is guaranteed if P ⇒ pmd(S,Q) holds.
- ◯ D. The correctness of the triple is guaranteed if pmd(S,Q) ⇒ P holds.

Preguntas 4 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Consider the following axiomatic definitions for the assignment and conditional instructions

wp(X := exp, Q) = Q[X ↦ exp]

wp(if B then i1 else i2, Q)=(B∧wp(i1,Q))∨(not(B)∧wp(i2, Q))

Which of the following expressions corresponds to the weakest precondition P of the following program with respect to the postcondition Q

{P}={?}
if x<0
  then y:= -x
  else y:= x+y
{Q}={y=0}

- ◯ A. P = (x ≥ 0 ∧ x + y = 0)
- ◯ B. P = (x ≥ 0 ∧ y ≥ 0)
- ◯ C. P = (x ≥ 0 ∧ x = y)
- ◯ D. P = (x = 0 ∧ x = y)

Preguntas 5 de 10

-0.33/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which of the following semantic descriptions of a programming language is the most useful in compiler design?

- ◯ A. Axiomatic semantics.
- ◯ B. Hoare's triples.
- ◯ C. Static semantics.
- ◯ D. Operational semantics.

Preguntas 6 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Mark the kind of semantics definition to which next rule belongs:

$$\frac{\langle i_0,e\rangle \Downarrow e'' \ \wedge \ \langle i_1,e''\rangle \Downarrow e'}{\langle i_0;i_1,e\rangle \Downarrow e'}$$

$$\frac{\langle i_0,e\rangle \Downarrow e'' \ \wedge \ \langle i_1,e''\rangle \Downarrow e'}{\langle i_0;i_1,e\rangle \Downarrow e'}$$

- ○ A. Axiomatic semantics.
- ○ B. Big-step operational semantics.
- ○ C. Small-step operational semantics.
- ○ D. Its own semantics.

Preguntas 7 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which is the function of the following operation *X+:a* defined by the following semantic rule:

$$\frac{\langle X,e\rangle \Rightarrow n_0 \qquad \langle a,e\rangle \Rightarrow n_1}{\langle X +: a, e\rangle \rightarrow \langle \text{skip}, e[X \mapsto n_0 + n_1]\rangle}$$

- ○ A. The value of expression a is assigned two times to the variable *X*.
- ○ B. The value of variable X is incremented by the value of expression *a*.
- ○ C. Variable X receives the double of the value of expression *a*.
- ○ D. Variable X receives the value of expression *a*.

Preguntas 8 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which configuration is required (in *) to make the following evaluation complete by using the small-step operational semantics?

⟨if X>Y then Y:=Y+X else Y:=0, {X ↦→ 42, Y ↦ 0}⟩
⟨X>Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ true
⟨X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
⟨Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ 0
→ ⟨Y:=Y+X, {X ↦ 42, Y ↦ 0}⟩
⟨Y+X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
⟨Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ 0
⟨X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
→ (*

- A. ⟨ Y:=0, {X ↦ 42, Y ↦ 0} ⟩
- B. ⟨ skip, {X↦ 42, Y ↦ 0} ⟩
- C. ⟨ if X>Y then Y:=Y+X else Y:=0, {X ↦ 42, Y ↦ 0} ⟩
- D. ⟨ skip, {X ↦ 42, Y ↦ 42} ⟩

Preguntas 9 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given the following transition rules for the small-step semantics associated to the conditional instruction

$$\frac{\langle b,e\rangle \Rightarrow \text{true}}{\langle \text{if } b \text{ then } i0 \text{ else } i1,e\rangle \rightarrow \langle i0,e\rangle} \qquad \frac{\langle b,e\rangle \Rightarrow \text{false}}{\langle \text{if } b \text{ then } i0 \text{ else } i1,e\rangle \rightarrow \langle i1,e\rangle}$$

determine which is the next configuration for ⟨if X<4 then X:=X-1 else X:=X+1,{X→3}⟩

- A. ⟨skip,{X↦2}⟩
- B. ⟨skip,{X↦4}⟩
- C. ⟨X:=X-1,{X↦3}⟩
- D. ⟨X:=X+1,{X↦3}⟩

Parte 3 de 3 - Third -0.33/ 1.0 Puntos

Preguntas 10 de 10

-0.33/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Indicate which of the following sentences is **FALSE**:

- ○ A. The mix implementation of a language combines the advantages of compilation and interpretation.
- ○ B. Interpreters are mainly used in script languages such as Perl or Postscript.
- ○ C. Intermediate code is generated by a compiler (e.g. P-code) providing portability to any platform.
- ○ D. Usually, an interpreter generates intermediate code that it is compiled into machine code.

Parte 1 de 3 - Second 0.67/ 2.0 Puntos

Preguntas 1 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Consider the following definition of an *identifier* using BNF notation

```
<digito>::= <par>|<impar>
<par> ::= 0|2|4|6|8
<impar>::= 1|3|5|7|9
<letra>::= x<letra>|y<par>|z<impar>
<identificador>::=<letra><digito>
```

Which of the following identifiers is **NOT** legal in the language defined by the previous rules?

- A. `xxy00`
- B. `xxy01`
- C. `z00`
- D. `z11`

Preguntas 2 de 10

-0.33/ 1.0 Puntos. Puntos descontados por fallo: 0.33

The following declaration of variables of a program in C

```
itn a
```

contains an error produced by misspelling the name of the default type for integers. This error is detected by the

- A. scanner
- B. parser
- C. semantic analyzer
- D. linker

Parte 2 de 3 - First 3.5/ 3.5 Puntos

Preguntas 3 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Two programs **P1** and **P2** are *equivalent* (**P1 ≈ P2**) if they have the same semantics. Considering the *big step* operational semantics as a basis to define such an equivalence, which of the following equivalence statements is **TRUE**?

- A. (x:= 5; while x>2 do x:= x-1) ≈ (x:= 1; x:= x+x)
- B. (P1 ≈ P2), siendo

  P1: x := 0; y := 2;
  if false then x:= y else y:= x;
  x := y;

  P2: x := 0; y := 2;
  if false then x := y else {y := x; x := y};

- C. (x := 1; while x < 2 do x:= x + 3) ≈ (x := 1)
- D. (x:=1; y:=3; if x <= y then x:=0 else x:=1) ≈ (x:=1; y:=3)

Preguntas 4 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Complete the following sentence:

"The following axiomatic semantic rule:
wp(X := exp;Q) = Q[X ↦ exp]

establishes that the weakest precondition of the assignment instruction X:=exp with respect to the postcondition is obtained by ..."

- A. replacing exp in Q by X.
- B. adding the expression X ↦ exp to Q.
- C. removing the expression X ↦ exp from Q.
- D. replacing every occurrence of X in Q by exp.

Preguntas 5 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which configuration is required (in *) to make the following evaluation complete by using the small-step operational semantics?

⟨if X>Y then Y:=Y+X else Y:=0, {X ↦→ 42, Y ↦ 0}⟩
⟨X>Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ true
⟨X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
⟨Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ 0
→ ⟨Y:=Y+X, {X ↦ 42, Y ↦ 0}⟩
⟨Y+X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
⟨Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ 0
⟨X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
→ (*

- A. ⟨ Y:=0, {X ↦ 42, Y ↦ 0} ⟩
- B. ⟨ skip, {X↦ 42, Y ↦ 0} ⟩
- C. ⟨ if X>Y then Y:=Y+X else Y:=0, {X ↦ 42, Y ↦ 0} ⟩
- D. ⟨ skip, {X ↦ 42, Y ↦ 42} ⟩

Preguntas 6 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Consider the following transition rules (for assignment and sequencing) of the small- step operational semantics of the small imperative language IMP studied in the course

$$\frac{\langle a, e\rangle \Rightarrow n}{\langle X := a, e\rangle \rightarrow \langle skip, e[X \mapsto n]\rangle}$$

$$\frac{\langle i0, e\rangle \rightarrow \langle i'0, e'\rangle}{\langle (i0; i1), e\rangle \rightarrow \langle (i'0; i1), e'\rangle} \qquad \frac{}{\langle (skip; i), e\rangle \rightarrow \langle i, e'\rangle}$$

Fill the gap below for an appropriate continuation of the following execution trace:

$\langle x:=x+y;y:=x+1,\{x\rightarrow 1,y\rightarrow 1\}\rangle$

$\langle x:=x+y,\{x\rightarrow 1,y\rightarrow 1\}\rangle$

$\langle x+y,\{x\rightarrow 1,y\rightarrow 1\}\rangle \Rightarrow 2$

$\rightarrow \langle skip,\{x\rightarrow 2,y\rightarrow 1\}\rangle$

$\rightarrow \langle skip;y:=x+1,\{x\rightarrow 2,y\rightarrow 1\}\rangle$

$\rightarrow \langle y:=x+1,\{x\rightarrow 2,y\rightarrow 1\}\rangle$

?

- A. $\rightarrow \langle skip,\{x\mapsto 2,y\mapsto 1\}\rangle$
- B. $\langle x+1,\{x\mapsto 2, y\mapsto 1\}\rangle \Rightarrow 3$
  $\rightarrow \langle skip,\{x\mapsto 2, y\mapsto 3\}\rangle$
- C. $\{x\mapsto 2, y\mapsto 1\} \Rightarrow 3$
  $\rightarrow \langle \{x\mapsto 2, y\mapsto 3\}\rangle$
- D. $\langle x+1,\{x\mapsto 2,y\mapsto 1\}\rangle \Rightarrow 3$

Preguntas 7 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

The big-step operational semantics

- A.
  establishes a relationship between the initial configuration $\langle P,e_0\rangle$ of the program and the final state e_f after the execution.
- B.
  yields the sequence of configurations (*trace*) which are obtained during the step-by-step execution of the program.
- C. can be used to establish the correctness of the program by means of the weakest precondition calculus.
- D. cannot be used to guide the implementation of programming languages.

Preguntas 8 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given a semantics S for a programming language, we say that two programs **i1** and **i2** are equivalent (written **i1 ≈ i2**) if they have the same semantics. If we consider the *big step* operational semantics for SIMP, which of the following program equivalence statements is **WRONG**?

- A. (y:=y) ≈ skip

  (donde skip es la instrucción vacía)
- B. (x:=y; y:=x) ≈ (y:=x; x:=y)
- C. (x:=y; y:=x) ≈ x:=y
- D. (if x >= 0 then x:= x-x else x:=x*0) ≈ x:=0

Preguntas 9 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Supposing that we extend the syntax of SIMP with the instruction =:= and add the following small-step semantic rule:

$$\frac{\langle X,e\rangle \Rightarrow n_0 \qquad \langle Y,e\rangle \Rightarrow n_1}{\langle X =:= Y, e\rangle \rightarrow \langle skip, e[X \mapsto n_1][Y \mapsto n_0]\rangle}$$

Which of the following sentences defines its meaning:

- A. It's a regular assignment but restricted to two variables in such a way that X is assigned the value of Y.
- B. Both variables X and Y are assigned an initial value.
- C. It exchanges the values of variables X and Y.
- D. Checks whether the values of variables X and Y are the same or not.

Parte 3 de 3 - Third 1.0/ 1.0 Puntos

Preguntas 10 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Which of the following sentences is **TRUE**

- A.
  In pure compiled languages each instruction is simultaneously analyzed and executed, so that programs are more efficient.
- B. Pure interpreted languages are high-level languages which are translated to intermediate code.
- C.
  In programming languages with a mixed implementation scheme the original language is translated into an intermediate language which is then interpreted.
- D.
  In pure programming languages the original language is translated into an object language which is then interpreted.

The following BNF grammar defines the syntax of a programming language:

<Bool> ::= True | False

<Num> ::=0|1|2|3

<Inst> ::= skip | if <Bool> then <Num> else <Num> | Inst ; Inst

Which of the following expressions is legal (i.e., it can be generated using the previous grammar)?

A. if True then 2 else 4;

B. if True then 2

C. if 1 then 2 else 4

D. if True then 1 else 2

Determine which is of the following expressions is not according to the following BNF grammar:

<logic_expression>::= <logic_expression> or <logic_expression> |

<logic_expression> and <logic_expression> |

(<logic_expression>) | not <logic_expression> |

true | false | <logic_variable>

<logic_variable>::= A | B | C | ... | Z

A. not (or A B)

B. (A or B) and not A

C. A and (C or B)

D. true and A

The big-step operational semantics

A. establishes a relationship between the initial configuration ⟨P,e0⟩ of the program and the final state Ef after the execution.

B. yields the sequence of configurations (trace) which are obtained during the step-by-step execution of the program.

C. can be used to establish the correctness of the program by means of the weakest precondition calculus.

D. cannot be used to guide the implementation of programming languages.

Which of the following aspects of a programming language is appropriate as a basis for building automatic tools to analyze the equivalence of programs?

A. Its generative grammar.

B. Its compiler.

C. Its parser.

D. Its semantics.

The small-step operational semantics for IMP can be described as:

A. A relation on program states.

B. A relation on configurations, i.e., pairs consisting of an instruction and a program state.

C. A relation between arithmetic expressions and integer values.

D. A relation between programs and logical assertions.

$$\frac{\langle i_0,\ e\rangle \Downarrow e' \ \wedge\ \boxed{*}}{\langle i_0; i_1,\ e\rangle \Downarrow e''}$$

Which expression should replace $\boxed{*}$ above?

A. $\langle i_1, e\rangle \Downarrow e''$

B. $\langle i_1, e\rangle \Downarrow \langle skip, e''\rangle$

C. $\langle i_1, e\rangle \Downarrow \langle skip, e'\rangle$

D. $\langle i_1, e'\rangle \Downarrow e''$

Which configuration is required (in *) to make the following evaluation complete by using the small-step operational semantics?

⟨if X>Y then Y:=Y+X else Y:=0, {X → 42, Y 0}⟩

⟨X>Y, {X 42, Y 0}⟩ ⇒ true

⟨X, {X 42, Y 0}⟩ ⇒ 42

⟨Y, {X 42, Y 0}⟩ ⇒ 0

→ ⟨Y:=Y+X, {X 42, Y 0}⟩

⟨Y+X, {X 42, Y 0}⟩ ⇒ 42

⟨Y, {X 42, Y 0}⟩ ⇒ 0

⟨X, {X 42, Y 0}⟩ ⇒ 42

→ (*

A. ⟨ Y:=0, {X 42, Y 0} ⟩

B. ⟨ skip, {X 42, Y 0} ⟩

C. ⟨ if X>Y then Y:=Y+X else Y:=0, {X 42, Y 0} ⟩

D. ⟨ skip, {X 42, Y 42} ⟩

For the following program and pre- and postconditions,

{P}

X:=X-1;

Y:=X;

{Q} = {Y>0}

which of the following expressions for P can be used to conclude program correctness according to the axiomatic semantics?

A. X=0.

B. X=1

C. X>0

D. X=2

Given a Hoare triple {P} S {Q}:

A. P and Q are programs and S is a machine state.

B. P is called the precondition, Q the postcondition, and P ⇒ Q always holds.

C. The correctness of the triple is guaranteed if P ⇒ pmd(S,Q) holds.

D. The correctness of the triple is guaranteed if pmd(S,Q) ⇒ P holds.

Indicate which of the following sentences is FALSE:

A. The mix implementation of a language combines the advantages of compilation and interpretation.

B. Interpreters are mainly used in script languages such as Perl or Postscript.

C. Intermediate code is generated by a compiler (e.g. P-code) providing portability to any platform.

D. Usually, an interpreter generates intermediate code that it is compiled into machine code.

With regard to the compilation process, which of the following shows the sequence of steps corresponding to the analysis phase:

A. Lexical Components(tokens) → Lexical Analysis → Intermediate Code → Syntactic Analysis → Parse Tree → Semantic Analysis → Source Code.

B. Source Code → Semantic Analysis → Intermediate Code → Lexical Analysis → Lexical Components(tokens) → Syntactic Analysis → Parse Tree.

C. Lexical Components(tokens) → Lexical Analysis → Parse Tree → Syntactic Analysis → Intermediate Code → Semantic Analysis → Source Code.

D. Source Code → Lexical Analysis → Lexical Components(tokens) → Syntactic Analysis → Parse Tree → Semantic Analysis → Intermediate Code.

NO ÉS LA B LA CORRECTA

Which is the main advantage of compilers with respect to interpreters?

A. The execution of compiled programs is faster than the execution of interpreted programs.

B. Program development and debugging is easier.

C. There is no advantage: interpreters do it better.

D. The generated code is more compact than the original program but slower than the interpreted program.

Given the program:

{P}

x := x+1;

y := y+2

{Q}= {x<y}

and the given postcondition Q, which of the following preconditions P is NOT correct for the program?

A. x=y

B. x<;y+1

C. x>y

D. x<;y

NO ÉS LA B LA CORRECTA

Which of the following statements is true?

A. The axiomatic semantics is a kind of declarative semantics of the programming languages.

B. Axiomatic semantics is the more natural semantics to describe declarative programming languages.

C. The axiomatic semantics is not suitable to describe the meaning of the imperative paradigm programs.

D. None of the previous.

NO ÉS LA C LA CORRECTA

Which is the function of the dynamic semantics?

A. Detect errors related to the syntax of the language.

B. Document the code.

C. The same as the static semantics but the dynamic semantics checks things during execution time.

D. Study the behavior of the programs during execution.

NO ÉS LA A LA CORRECTA

Which of the following statements about operational semantics is FALSE:

A. The machine state is a function that assigns values to the variables of the program.

B. This is the style used to define the first programming language.

C. In the big-step operational semantics, the execution of a program can be seen as a transition from the initial configuration to the final one.

D. It provides a method for language implementation.

Which is the most appropriate semantic style for program verification?

A. Small-step operational semantics.

B. Small-step operational semantics.

C. Axiomatic semantics.

D. Denotational semantics.

Which of the following statements is false?

A. A lexical analyzer (scanner) is a program that splits a string (the program) in a sequence of primitive syntactic components or tokens.

B. The dynamic semantics of the language is checked during one of the compilation phases

C. A parser is a program that recognizes a sequence of tokens and builds a sequence of instructions.

D. A semantic analyzer is a program that checks the static semantics of language.

Tests & Quizzes

Self-Assessment Test Theme 2

Return to Assessment List

Part 1 of 3 - Second 1.0/ 2.0 Points

Question 1 of 10

1.0/ 1.0 Points. Point(s) deducted for incorrect answer: 0.33

With regard to program compilation, which of the following claims is **TRUE**?

- A.
  The lexical analyzer is a program that recognizes a sequence of tokens and builds a sequence of instructions.
- B.
  The syntactic analyzer is a program that splits a sequence of characters (the source code) into a sequence of tokens.
- C.
  The output of a syntactic analyzer is a *parse tree* which corresponds to the instructions in the source code of the analyzed program
- D.
  The semantic analysis checks for runtime errors that can be detected only during the execution (e.g., indices out of range in a vector).

Question 2 of 10

0.0/ 1.0 Points. Point(s) deducted for incorrect answer: 0.33

Determine which is of the following expressions is not according to the following BNF grammar:

<logic_expression>::= <logic_expression> or <logic_expression> |
<logic_expression> and <logic_expression> |
(<logic_expression>) | not <logic_expression> |
true | false | <logic_variable>
<logic_variable>::= A | B | C | ... | Z

- A. not (or A B)
- B. (A or B) and not A
- C. A and (C or B)
- D. true and A

Part 2 of 3 - First 2.17/ 3.5 Points

Question 3 of 10

0.5/ 0.5 Points. Point(s) deducted for incorrect answer: 0.33

For the following program execution using the big-step operational semantics:

$\langle$ while X>0 do X:=X-1, {X $\mapsto$ 2}$\rangle$ $\Downarrow e$

which is the value of *e*?

- A. {X $\mapsto$ 0}
- B. {X $\mapsto$ 1}
- C. $\langle$skip,{X $\mapsto$ 0}$\rangle$
- D. $\langle$skip, {X $\mapsto$ 1}$\rangle$

Question 4 of 10

0.5/ 0.5 Points. Point(s) deducted for incorrect answer: 0.33

Assume the syntax of the IMP language studied in the course augmented with a new instruction $X \pm Y$ where X and Y are two numeric variables; accordingly, the following transition rule is added to the *small-step* operacional semantics:

$$\frac{\langle X,e\rangle \Rightarrow n_0 \qquad \langle Y,e\rangle \Rightarrow n_1}{\langle X \pm Y, e\rangle \rightarrow \langle \surd, e[X \mapsto n_1 - n_0][Y \mapsto n_0 + n_1]\rangle}$$

What is *e* in the transition $\langle X \pm Y, \{X \mapsto 2, Y \mapsto 3\}\rangle \rightarrow \langle$skip,$e\rangle$?

- A. $e = \{X \mapsto 1, Y \mapsto 5\}$
- B. $e = \{X \mapsto 5, Y \mapsto 1\}$
- C. $e = \{X \mapsto -1, Y \mapsto 5\}$
- D. $e = \{X \mapsto 5, Y \mapsto -1\}$

Question 5 of 10

-0.33/ 0.5 Points. Point(s) deducted for incorrect answer: 0.33

Given a Hoare triple {P} S {Q}:

- A. P and Q are programs and S is a machine state.
- B. P is called the precondition, Q the postcondition, and P ⇒ Q always holds.
- C. The correctness of the triple is guaranteed if P ⇒ pmd(S,Q) holds.
- D. The correctness of the triple is guaranteed if pmd(S,Q) ⇒ P holds.

Question 6 of 10

0.5/ 0.5 Points. Point(s) deducted for incorrect answer: 0.33

The small-step operational semantics for IMP can be described as:

- A. A relation on program states.
- B. A relation on configurations, i.e., pairs consisting of an instruction and a program state.
- C. A relation between arithmetic expressions and integer values.
- D. A relation between programs and logical assertions.

Question 7 of 10

0.5/ 0.5 Points. Point(s) deducted for incorrect answer: 0.33

Given the following transition rules for the small-step semantics associated to the conditional instruction

$$\frac{\langle b,e\rangle \Rightarrow \text{true}}{\langle \text{if } b \text{ then } i0 \text{ else } i1,e\rangle \rightarrow \langle i0,e\rangle} \qquad \frac{\langle b,e\rangle \Rightarrow \text{false}}{\langle \text{if } b \text{ then } i0 \text{ else } i1,e\rangle \rightarrow \langle i1,e\rangle}$$

determine which is the next configuration for $\langle \text{if } X<4 \text{ then } X:=X-1 \text{ else } X:=X+1, \{X \rightarrow 3\}\rangle$

- A. $\langle \text{skip}, \{X \mapsto 2\}\rangle$
- B. $\langle \text{skip}, \{X \mapsto 4\}\rangle$
- C. $\langle X:=X-1, \{X \mapsto 3\}\rangle$
- D. $\langle X:=X+1, \{X \mapsto 3\}\rangle$

Question 8 of 10

0.5/ 0.5 Points. Point(s) deducted for incorrect answer: 0.33

Obtain the weakest precondition for the following code excerpt with respect to the postcondition Q=(y=1):

{P}
if x=0 then y:= x+1
else y:= x*x

- A. $(x=0) \wedge (y=1)$
- B. $(x=0) \vee (x=1) \vee (x=-1)$
- C. x
- D. y=0

Question 9 of 10

0.0/ 0.5 Points. Point(s) deducted for incorrect answer: 0.33

Consider the following definitions for the weakest precondition calculus:

wp(X:= exp, Q) = Q[X ↦ exp]

wp(i1;i2, Q) = wp(i1, wp(i2, Q))

Which is the outcome of wp((X:=X+1;Y:=Y-1; X:=X+Y'), X>0) ?

- A. X>0 ∧ Y>0
- B. X+Y>0
- C. X+Y>=0
- D. X>=0 ∧ Y>=0

Part 3 of 3 - Third 1.0/ 1.0 Points

Question 10 of 10

1.0/ 1.0 Points. Point(s) deducted for incorrect answer: 0.33

Given a program *P* and a program-specification P_E, which of the following claims is **WRONG**?

- A. The semantics of *P* and P_E is helpful to verify whether *P* is a correct (and complete) implementation of P_E.
- B. If the semantics of *P* and P_E coincide, then we can say that *P* is a correct and complete implementation of the specification P_E.
- C. If the semantics of *P* and P_E coincide, this means that *P* and P_E are syntactically equal.
- D. Two syntactically different programs *P* and P_E may have the same semantics.

LTP > Exámenes

Exámenes

Self-Assessment Test Theme 2

Volver a la Lista de Examenes

Parte 1 de 3 - Second 2.0/ 2.0 Puntos

Preguntas 1 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

The following BNF grammar defines the syntax of a programming language:

<Bool> ::= True | False

<Num> ::=0|1|2|3

<Inst> ::= skip | if <Bool> then <Num> else <Num> | Inst ; Inst

Which of the following expressions is legal (i.e., it can be generated using the previous grammar)?

- A. if True then 2 else 4;
- B. if True then 2
- C. if 1 then 2 else 4
- D. if True then 1 else 2

Preguntas 2 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Given a *wrong* program sentence like:

```
if (x>0) else x:=x+1 then x:=x-1
```

which of the compiling phases detects its incorrectness?

- A. Lexical analysis.
- B. Syntactic analysis.
- C. Semantic analysis.
- D. Static analysis.

Parte 2 de 3 - First 3.5/ 3.5 Puntos

Preguntas 3 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given the following transition rules for the small-step semantics associated to the conditional instruction

$$\frac{\langle b,e\rangle \Rightarrow \text{true}}{\langle \text{if } b \text{ then } i0 \text{ else } i1,e\rangle \rightarrow \langle i0,e\rangle} \qquad \frac{\langle b,e\rangle \Rightarrow \text{false}}{\langle \text{if } b \text{ then } i0 \text{ else } i1,e\rangle \rightarrow \langle i1,e\rangle}$$

determine which is the next configuration for $\langle \text{if } X<4 \text{ then } X:=X-1 \text{ else } X:=X+1, \{X \rightarrow 3\}\rangle$

- A. $\langle \text{skip}, \{X \mapsto 2\}\rangle$
- B. $\langle \text{skip}, \{X \mapsto 4\}\rangle$
- C. $\langle X:=X-1, \{X \mapsto 3\}\rangle$
- D. $\langle X:=X+1, \{X \mapsto 3\}\rangle$

Preguntas 4 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

The small-step operational semantics for IMP can be described as:

- A. A relation on program states.
- B. A relation on configurations, i.e., pairs consisting of an instruction and a program state.
- C. A relation between arithmetic expressions and integer values.
- D. A relation between programs and logical assertions.

Preguntas 5 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

For the following program and pre- and postconditions,

```
{P}
X:=X-1;
Y:=X;
{Q} = {Y>0}
```

which of the following expressions for P can be used to conclude program correctness according to the axiomatic semantics?

- A. `X=0`.
- B. `X=1`
- C. `X>0`
- D. `X=2`

Preguntas 6 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which configuration is required (in *) to make the following evaluation complete by using the small-step operational semantics?

⟨if X>Y then Y:=Y+X else Y:=0, {X ↦ → 42, Y ↦ 0}⟩
⟨X>Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ true
⟨X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
⟨Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ 0
→ ⟨Y:=Y+X, {X ↦ 42, Y ↦ 0}⟩
⟨Y+X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
⟨Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ 0
⟨X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
→ (*

- ◯ A. ⟨ Y:=0, {X ↦ 42, Y ↦ 0} ⟩
- ◯ B. ⟨ skip, {X↦ 42, Y ↦ 0} ⟩
- ◯ C. ⟨ if X>Y then Y:=Y+X else Y:=0, {X ↦ 42, Y ↦ 0} ⟩
- ◯ D. ⟨ skip, {X ↦ 42, Y ↦ 42} ⟩

Preguntas 7 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which is the most appropriate semantic style for program verification?

- ◯ A. Small-step operational semantics.
- ◯ B. Small-step operational semantics.
- ◯ C. Axiomatic semantics.
- ◯ D. Denotational semantics.

Preguntas 8 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given the following axiomatic definitions for the assignment and conditional instruction,

wp(X := exp, Q) = Q[X ↦ exp]
wp(if B then i1 else i2, Q) = (B ^ wp(i1, Q)) v (not(B) ^ wp(i2, Q))
which is the weakest precondition wp(S,Q) for program S:

if x<z then z=z+3 else x=x+3

and postcondition Q = (x > 0)?

- A. wp(S,Q) = (x < z ∧ x > 0) v (x >= z ∧ x + 3 > 0)
- B. wp(S,Q) = (x < z ∧ x > 3) v (x <= z ∧ x > 0)
- C. wp(S,Q) = (x > z + 3)
- D. wp(S,Q) = (x < z + 3)

Preguntas 9 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which of the following statements concerning the semantics of programming languages is false?

- A. Semantics is a key tool to make comparisons between different programs.
- B. The semantics description of a program is unnecessary if the language syntax is defined formally.
- C. The operational semantics of a language is part of its dynamic semantics.
- D.
  The semantics of a programming language is the basis to develop advanced tools of program development in that language.

Parte 3 de 3 - Third 1.0/ 1.0 Puntos

Preguntas 10 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Which of the following claims is **TRUE**?

- A. There is only one definition style for dynamic semantics: the operational style.
- B. Static and dynamic semantics coincide for all programming languages.
- C. The dynamic semantics describes the compilation-time behavior of a program.
- D.
  A reason why dynamic semantics is necessary is the existence of undecidable program properties (e.g., whether a division-by-zero is going to happen during the program execution).

LTP > Exámenes

Exámenes

Self-Assessment Test Theme 2

Volver a la Lista de Examenes

Parte 1 de 3 - Second 2.0/ 2.0 Puntos

Preguntas 1 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Given the following BNF grammar:

```
<arit> ::= <num> + <num> | <num> - <num>
<expression> ::= <var> = <arit> | <arit> = <var> | <expression> ; <expression>
<num> ::= 1 | 2 | 3 | 4 | 5
<var> ::= X | Y | Z
```

which of the following claims is **NOT** valid with respect to the grammar?

- A. 1+1 is an <arit> expression.
- B. 1+2-3 is an <arit> expression.
- C. 1+2=X is an <expression> expression.
- D. Z=2+3;Y=1-4 is an <expression> expression.

Preguntas 2 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Given a *wrong* program sentence like:

```
if (x>0) else x:=x+1 then x:=x-1
```

which of the compiling phases detects its incorrectness?

- A. Lexical analysis.
- B. Syntactic analysis.
- C. Semantic analysis.
- D. Static analysis.

Parte 2 de 3 - First 2.67/ 3.5 Puntos

Preguntas 3 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

The dynamic semantics of a program:

- A. Is obtained from the program text during the semantic analysis phase.
- B.
  Concerns changes in the program text that are eventually introduced whenever a new program requirement is given by the end user.
- C. Such a concept does not exist; in programming languages, only static semantics are considered.
- D.
  Is used to reason about program execution. Depending on the considered semantic description we can implement an
  interpreter, verifiy program properties given by means of assertions, etc.

Preguntas 4 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which of the following claims is **WRONG**?

- A. Axiomatic semantics is a dynamic semantics style.
- B. Dynamic semantics can be used to analyze interesting program properties like termination.
- C. Dynamic semantics provides a representation of the runtime behavior of programs.
- D. Operational semantics is a static semantics style.

Preguntas 5 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which configuration is required (in *) to make the following evaluation complete by using the small-step operational semantics?

⟨if X>Y then Y:=Y+X else Y:=0, {X ↦→ 42, Y ↦ 0}⟩
⟨X>Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ true
⟨X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
⟨Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ 0
→ ⟨Y:=Y+X, {X ↦ 42, Y ↦ 0}⟩
⟨Y+X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
⟨Y, {X ↦ 42, Y ↦ 0}⟩ ⇒ 0
⟨X, {X ↦ 42, Y ↦ 0}⟩ ⇒ 42
→ (*

- ◯ A. ⟨ Y:=0, {X ↦ 42, Y ↦ 0} ⟩
- ◯ B. ⟨ skip, {X↦ 42, Y ↦ 0} ⟩
- ◯ C. ⟨ if X>Y then Y:=Y+X else Y:=0, {X ↦ 42, Y ↦ 0} ⟩
- ◯ D. ⟨ skip, {X ↦ 42, Y ↦ 42} ⟩

Preguntas 6 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given the following axiomatic definitions for the assignment and conditional instruction,

wp(X := exp, Q) = Q[X ↦ exp]
wp(if B then i1 else i2, Q) = (B ^ wp(i1, Q)) v (not(B) ^ wp(i2, Q))
which is the weakest precondition wp(S,Q) for program S:

if x<z then z=z+3 else x=x+3

and postcondition Q = (x > 0)?

- ◯ A. wp(S,Q) = (x < z ∧ x > 0) v (x >= z ∧ x + 3 > 0)
- ◯ B. wp(S,Q) = (x < z ∧ x > 3) v (x <= z ∧ x > 0)
- ◯ C. wp(S,Q) = (x > z + 3)
- ◯ D. wp(S,Q) = (x < z + 3)

Preguntas 7 de 10

-0.33/ 0.5 Puntos. Puntos descontados por fallo: 0.33

According to the small-step semantics studied in the course, which of the following claims is **TRUE**?

- ◯ A. The configuration ⟨skip, *e*⟩ witnesses the end of the program execution.
- ◯ B. The transition ⟨skip;i_2, *e*⟩ → ⟨i_2, *e*⟩ is not possible.
- ◯ C. An infinite trace like ⟨i_1, e_1⟩ → ⟨i_2, e_2⟩ → ...□ □ is not possible.
- ◯ D. If ⟨*a*, *e*⟩ ⇒ *n*, then ⟨*x*:=*a*, *e*⟩ → *e*[*x*↦*n*].

Preguntas 8 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Given the axiomatic definition of the conditional instruction

pmd(if B then i1 else i2, Q) = (B ^ pmd(i1, Q)) v (not(B) ^ pmd(i2, Q))

and {Q}={y=4}, which is the weakest precondition for the following program?:

```
if x>=0
    then y:=x
    else y:=-x
```

- ◯ A. (x = 4) ∨ (x = -4)
- ◯ B. (x = 4) ∧ (x = -4)
- ◯ C. x = 4
- ◯ D. x = -4

Preguntas 9 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

In order to enrich the language **SIMP**, we add a new command **swap***(x,y)* that swaps, in a single step, the value of variables x and y. Which of the following small-step-like definitions provides an appropriate semantic description for this command?

- A. $\dfrac{\langle x,e\rangle \Rightarrow a \wedge \langle y,e\rangle \Rightarrow b}{\langle \text{swap}(x,y),\ e\rangle \rightarrow \langle \text{skip},\ e[x \mapsto b,\ y \mapsto a]\rangle}$
- B. $\dfrac{}{\langle \text{swap}(x,y),\ e\rangle \rightarrow \langle (x:=y;\ y:=x),\ e\rangle}$
- C. $\dfrac{\langle x:=y,\ e\rangle \rightarrow \langle \text{skip},\ e'\rangle \wedge \langle y:=x,\ e'\rangle \rightarrow \langle \text{skip},\ e''\rangle}{\langle \text{swap}(x,y),\ e\rangle \rightarrow \langle \text{skip},\ e''\rangle}$
- D. $\dfrac{\langle x,\ e\rangle \Rightarrow \text{true} \wedge \langle y,\ e\rangle \Rightarrow \text{true}}{\langle \text{swap}(x,y),\ e\rangle \rightarrow \langle \text{skip},\ e[x \mapsto y,\ y \mapsto x]\rangle}$

Parte 3 de 3 - Third 1.0/ 1.0 Puntos

Preguntas 10 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Given a program P and a program-specification P_E, which of the following claims is **WRONG**?

- A. The semantics of P and P_E is helpful to verify whether P is a correct (and complete) implementation of P_E.
- B. If the semantics of P and P_E coincide, then we can say that P is a correct and complete implementation of the specification P_E.
- C. If the semantics of P and P_E coincide, this means that P and P_E are syntactically equal.
- D. Two syntactically different programs P and P_E may have the same semantics.

Exámenes

Self-Assessment Test Theme 2

Volver a la Lista de Examenes

Parte 1 de 3 - Second 2.0/ 2.0 Puntos

Preguntas 1 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

With regard to program compilation, which of the following claims is **TRUE**?

- A.
  The lexical analyzer is a program that recognizes a sequence of tokens and builds a sequence of instructions.
- B.
  The syntactic analyzer is a program that splits a sequence of characters (the source code) into a sequence of tokens.
- C.
  The output of a syntactic analyzer is a *parse tree* which corresponds to the instructions in the source code of the analyzed program
- D.
  The semantic analysis checks for runtime errors that can be detected only during the execution (e.g., indices out of range in a vector).

Preguntas 2 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

The following BNF grammar defines the syntax of a programming language:

<Bool> ::= True | False

<Num> ::=0|1|2|3

<Inst> ::= skip | if <Bool> then <Num> else <Num> | Inst ; Inst

Which of the following expressions is legal (i.e., it can be generated using the previous grammar)?

- A. if True then 2 else 4;
- B. if True then 2
- C. if 1 then 2 else 4
- D. if True then 1 else 2

Parte 2 de 3 - First 3.5/ 3.5 Puntos

Preguntas 3 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

According to the following rules, what does the 3-ary operator *a0 = b = a1* do, where *a0* and *a1* are arithmetic expressions, and *b* a boolean expression?

$$\frac{\langle b,e\rangle \Rightarrow true \quad \langle a0,e\rangle \Rightarrow n0}{\langle a0 = b = a1,e\rangle \Rightarrow n0} \qquad \frac{\langle b,e\rangle \Rightarrow false \quad \langle a1,e\rangle \Rightarrow n1}{\langle a0 = b = a1,e\rangle \Rightarrow n1}$$

- A. It returns *true* if condition *b* holds, and *false* otherwise.
- B. Command *a0* is executed if *b* is true, and *a1 is executed otherwise*.
- C. It returns the addition of the arithmetic expressions *a0* and *a1*.
- D. It returns the value of *a0* if *b* holds, and the value of *a1 otherwise*.

Preguntas 4 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which is the function of the following operation *X+:a* defined by the following semantic rule:

$$\frac{\langle X,e\rangle \Rightarrow n_0 \qquad \langle a,e\rangle \Rightarrow n_1}{\langle X +: a, e\rangle \rightarrow \langle \text{skip}, e[X \mapsto n_0 + n_1]\rangle}$$

- A. The value of expression a is assigned two times to the variable *X*.
- B. The value of variable X is incremented by the value of expression *a*.
- C. Variable X receives the double of the value of expression *a*.
- D. Variable X receives the value of expression *a*.

Preguntas 5 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

The big-step operational semantics

- A.
  establishes a relationship between the initial configuration $\langle P,e_0\rangle$ of the program and the final state e_f after the execution.
- B.
  yields the sequence of configurations (*trace*) which are obtained during the step-by-step execution of the program.
- C. can be used to establish the correctness of the program by means of the weakest precondition calculus.
- D. cannot be used to guide the implementation of programming languages.

Preguntas 6 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Two programs **P1** and **P2** are *equivalent* (**P1 ≈ P2**) if they have the same semantics. Considering the *big step* operational semantics as a basis to define such an equivalence, which of the following equivalence statements is **TRUE**?

- A. (x:= 5; while x>2 do x:= x-1) ≈ (x:= 1; x:= x+x)
- B. (P1 ≈ P2), siendo

  P1: x := 0; y := 2;
  if false then x:= y else y:= x;
  x := y;

  P2: x := 0; y := 2;
  if false then x := y else {y := x; x := y};

- C. (x := 1; while x < 2 do x:= x + 3) ≈ (x := 1)
- D. (x:=1; y:=3; if x <= y then x:=0 else x:=1) ≈ (x:=1; y:=3)

Preguntas 7 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Supposing that we extend the syntax of SIMP with the instruction =:= and add the following small-step semantic rule:

$$\frac{\langle X,e\rangle \Rightarrow n_0 \qquad \langle Y,e\rangle \Rightarrow n_1}{\langle X =:= Y, e\rangle \rightarrow \langle skip, e[X \mapsto n_1][Y \mapsto n_0]\rangle}$$

Which of the following sentences defines its meaning:

- A. It's a regular assignment but restricted to two variables in such a way that X is assigned the value of Y.
- B. Both variables X and Y are assigned an initial value.
- C. It exchanges the values of variables X and Y.
- D. Checks whether the values of variables X and Y are the same or not.

Preguntas 8 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which of the following statements about operational semantics is FALSE:

- A. The machine state is a function that assigns values to the variables of the program.
- B. This is the style used to define the first programming language.
- C.
  In the big-step operational semantics, the execution of a program can be seen as a transition from the initial configuration to the final one.
- D. It provides a method for language implementation.

Preguntas 9 de 10

0.5/ 0.5 Puntos. Puntos descontados por fallo: 0.33

Which is the function of the dynamic semantics?

- A. Detect errors related to the syntax of the language.
- B. Document the code.
- C. The same as the static semantics but the dynamic semantics checks things during execution time.
- D. Study the behaviour of the programs during execution.

Parte 3 de 3 - Third 1.0/ 1.0 Puntos

Preguntas 10 de 10

1.0/ 1.0 Puntos. Puntos descontados por fallo: 0.33

Which of the following claims about compilation (or translation) and interpretation in the implementation of programming languages is **WRONG**?

- A. Interpreters are more appropriate during program development, whereas compilers are better for a final use of the program.
- B. Compilers are more appropriate during program development, whereas interpreters are better for a final use of the program.
- C. In practice, a pure translation or pure interpretation is never used; a mixed implementation approach is preferred instead.
- D. Java follows a mixed implementation approach.