**REVIEW QUESTIONS**

**1. Define syntax and semantics.**

* Syntax = form of expressions, statements, and program units
* Semantics = meaning of the expressions, statements, and program units

**2. Who are language descriptions for?**

* Initial evaluators
* Implementors
* Users

**3. Describe the operation of a general language generator.**

* Device that can be used to generate the sentences of the language
* Generates predictable sentences
* Limited usefulness as a language descriptor

**4. Describe the operation of a general language recognizer.**

* Device capable of reading strings of characters from alphabet
* Analyze given strings and either accept or reject based from language given
* Filters correct and incorrect sentences

**5. What is the difference between a sentence and a sentential form?**

* Sentence = a sentential form that only has terminal symbols
* Sentential Form = every string of symbols in the deviation

**6. Define a left-recursive grammar rule.**

* When a grammer rule has its LHS also appearing at the beginning of its RHS

**7. What three extensions are common to most EBNFs?**



**8. Distinguish between static and dynamic semantics.**

* Static Semantics = indirectly related to the meaning of programs during execution. Focuses more on the legal forms of programs (syntax). Checked at compile time
* Dynamic Semantics = describing the meaning of the programs. Precise knowledge what statements do. Compile writers determine the semantics of a language

**9. What purpose do predicates serve in an attribute grammar?**

* State the static semantic rules of the language

**10. What is the difference between a synthesized and an inherited attribute?**

* Synthesized Attribute = result of the attribute evaluation rules. May use the inherited attribute values. Pass semantic information up the parse tree
* Inherited Attribute = Passed down from parent nodes. Pass semantic information down the parse tree

**11. How is the order of evaluation of attributes determined for the trees of a**

**given attribute grammar?**

* Based on underlying BNF grammar
* Possible empty set of attribute values attached to each node

**12. What is the primary use of attribute grammars?**

* Describe more of the structure of a programming language than can be described with a context-free grammar

**13. Explain the primary uses of a methodology and notation for describing**

**the semantics of programming languages.**

* Programmers need to know what statements do to use them effectively
* Compiler writers must know what language constructs mean to correctly implement designs
* Language designers should develop the semantic descriptions of the language and discover ambiguities and inconsistencies in their design in the process

**14. Why can machine languages not be used to define statements in**

**operational semantics?**

* Steps in machine language execution and changes to the state and machine are small and numerous.
* Storage of computing machines is too large and complex. Several levels of memory devices

**15. Describe the two levels of uses of operational semantics.**

* Highest Level = interest in the final result of the execution of a complete program. "Natural Operational Semantics"
* Lowest Level = determine the precise meaning of a program through an examination of the complete sequence of state changes during execution. "Structural Operational Semantics"

**16. In denotational semantics, what are the syntactic and semantic domains?**

* Domain (Syntactic Domain) = collection of values that are genuine parameters to a function
* Range (Semantic Domain) = collection of objects to which the parameters are mapped

**17. What is stored in the state of a program for denotational semantics?**

* Value of all current variables

**18. Which semantics approach is most widely known?**

* Denotational Semantics

**19. What two things must be defined for each language entity in order to**

**construct a denotational description of the language?**

* Objects
* Functions

**20. Which part of an inference rule is the antecedent?**

* Antecedent = Top part

**21. What is a predicate transformer function?**

* Wp (statement, post condition) = precondition
* A wp function is called a predicate transformer. Takes a predicate as a parameter and returns another predicate

**22. What does partial correctness mean for a loop construct?**

* When termination is not guaranteed

**23. On what branch of mathematics is axiomatic semantics based?**

* Mathematics Logic

**24. On what branch of mathematics is denotational semantics based?**

* Mathematical Objects ( Denotations )

**25. What is the problem with using a software pure interpreter for**

**operational semantics?**

* Detailed characteristics of the particular computer would make actions difficult to understand.
* Machine-dependent semantic definition

**26. Explain what the preconditions and postconditions of a given statement**

**mean in axiomatic semantics.**

* Assertion (Precondition) = assertion before a statement states the relationships and constraints among variables that are true at a certain point in execution.
* Postcondition = assertion following a statement

**27. Describe the approach of using axiomatic semantics to prove the**

**correctness of a given program.**

* Specifies what can be proven about the program
* States precisely the meaning of the statements and programs in terms of logic expressions

**28. Describe the basic concept of denotational semantics.**

* Mapping every syntactic entity associated with a programming language into some form of mathematical entity, translating programming language constructs into mathematical objects

**29. In what fundamental way do operational semantics and denotational**

**semantics differ?**

* Operational Semantics = state changes are defined by coded algorithms for a virtual machine
* Denotational Semantics = rigorous mathematical functions