Tutorials on Principles of Programming Language

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PSEUDO CODE (Evolution of Programming Language)

1. Define programming language. What is the importance of studying programming language for software managers, language designers and implementers?
2. Briefly discuss the phenomenology of programming languages.
3. What are the characteristics of a good programming language?
4. What are the major programming languages paradigms?
5. Explain the application of pseudo code in programming.
6. How can pseudo code interpreters simplify programming?
7. What are the programming domains? How does logical programming differ from functional programming?
8. "The complexity of programming led to the development of program design notations". If this is true, explain with reference to pseudo code.
9. Explain about the "Fascination and fear are common to new tools".
10. Explain the design of a pseudo code and its implementation. Highlight the functional enhancements brought by the pseudo code.

FORTRAN (Emphasis on Efficiency)

1. Describe the name structure of FORTRAN language.
2. What do you mean by dynamic chain of activation record ? Explain the control structure of FORTRAN.
3. Illustrate looping in FORTRAN by writing a program to find out the square root of the first 20 natural numbers.
4. "Pass by reference is a dangerous proposition in FORTRAN". Justify this statement with a suitable example.
5. Give specific examples where FORTRAN-IV violates the principles of programming languages.
6. "FORTRAN has been revised several times". Explain this statement with a successive history of FORTRAN.
7. How is data represented in FORTRAN ? Differentiate the roles of arrays from those of scalar data types of FORTRAN data structure.
8. Describe the modes of passing parameters in FORTRAN with examples.
9. Write a FORTRAN program to find the sum and the average of the first 10 odd natural numbers.
10. "Subprograms are implemented using activation records in FORTRAN". Explain with the help of examples.

ALGOL (Generality and Hierarchy)

1. ALGOL follows the "zero –one - infinity" principle. Verify it by comparing it with FORTRAN.
2. How has ALGOL changed the way of programming in an efficient way? Explain.
3. Explain the data structures of ALGOL-60. Describe different forms of for loop for ALGOL.
4. Explain the history and motivation of ALGOL programming.Also explain and mention its failure factors.
5. Prepare a lecture note of control structure. Data structure,name structure and syntactic structure in ALGOL.
6. How are the enhanced features of EBNF efficient as compared to BNF with the help of examples?
7. Why are naming structures essential for programming? Explain the name structure of ALGOL-60.
8. "ALGOL was a major milestone in programming languages." Justify this statement. Also explain how ALGOL-60 became its final version.
9. Why is "Pass-by-name" in ALGOL-60 considered as a dangerous and expensive method? Explain with a suitable example.
10. Define the terms BNF and EBNF. What are the significant uses of context-free and regular grammar?

LISP (List Processing and Functional Programming)

1. What is LISP? Explain the structural organization of Lisp with a suitable example.
2. How has Lisp maintained the simplicity principle? Explain the different searching techniques in LISP with the help of a walking down diagram.
3. Differentiate between Association list and property list with relevant examples.
4. Differentiate between car and cdr.
5. How does car and cdr help in searching the data elements? Explain with the help of a Walking down diagram.
6. Write an assoc function in LISP to access the value of a-list. How would you handle the case where the requested attribute is not associated with a-list?
7. What is polish notation? How Hierarchical Structures are processed in LISP?
8. Explain the structures: Conditional expression, The logical connectives and Mapcar and reduce functions
9. Short Notes: User Defined Function in LISP, car cdr function, Storage Reclamation and Recursive Interpreters
10. Translate the following expressions into LISP:-

$$\frac{1}{2}\sqrt{\Pi r^2 - l^2} \qquad (-1)^k k^{(1/k)} \qquad \frac{n!}{r!\,(n-r)!}$$

$$\frac{-b-\sqrt{b^2-4ac}}{2a} \qquad \frac{-b-\sqrt{b^2-4ac}}{\sqrt[\frac{1}{2}]{4a^2-b^2}} \qquad \frac{(abc)^2}{\sqrt[\frac{3}{4}]{s(s-a)(s-b)(s-c)}}$$

SMALL TALK (Object Oriented Programming)

1. Explain Message Passing and Returning Mechanism in SMALLTALK. (Most repeated)
2. Describe three forms of message template in SMALLTALK. (Most repeated)
3. "Smalltalk belongs to a new programming paradigm". Explain in reference to class, object- and object-oriented Extensions.
4. How is Activation Record represented in SMALLTALK?
5. How do classes allow multiple representation of data types in SmallTalk? Explain with the help of orthogonal classification.
6. "Programming language needs name structure, syntactic structure and control structure". Why? How does machine independence support better syntactic structure?
7. Explain how SmallTalk represents the object-oriented paradigm with suitable examples.
8. Compare and Contrast object oriented programming facilities in C++ and Java.

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