KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2024

Marks Scored:

Level : B.E.
Year : III

Course : COMP 301
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 28 JUL 2024

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Choose and encircle in the most appropriate option from each set of choices

1. The first widely used programming language developed for AI applications was_____
   a. Prolog
   b. ALGOL 60
   c. The functional language Lisp
   d. Fortran

2. Which of the following is the language evaluation criteria
   a. Writability
   b. Simplicity
   c. Orthogonality
   d. Support for abstraction

3. To which of the following programming language paradigms does Lisp belong to:
   a. Logical
   b. Functional
   c. Object-oriented
   d. Imperative

4. Any string of terminals that can be generated by the following CFG is
   $S \rightarrow aSa \mid bSb \mid a \mid b$

   a. All odd and even length palindromes
   b. String that begin and end with different symbol
   c. All even length palindrome
   d. All odd length palindromes

5. Which of the following language is declarative
   a. SQL
   b. Algol
   c. C#
   d. Java

6. What relationship does the following prolog problem represent?
   r(X,Y):- parent(Z,X).parent(Z,Y).male(X).X\=Y.
   a. Y is the sister of X or X is male
   b. X is male and X is father of Y
   c. X is the brother of Y
   d. Y is the sister of X

7. What relationship does the following prolog problem represent?
   professor(X,Y):-teaches(X, C), studies(Y, C)
   a. X is a professor of Y only.
   b. X is a professor of Y if X teaches C and Y studies C.
   c. X is a professor of Y if X teaches C or Y studies C.
   d. syntax error

8. The forms of the tokens of programming languages is described by.....
   a. Backus-Naur form
   b. Regular grammars
   c. Context Free Grammar
   d. Context Sensitive Grammar

9. The abstractions on a BNF description, or grammar, are often called..... And the lexemes and tokens of the rules are called .....
   a. nonterminal, terminals
   b. terminals, nonterminals
   c. rule, terminals
   d. Attribute grammar, terminals

10. Regular expression for all strings starts with ba and ends with aab is
   a. ba(a*+b*)aab b. ba(ab)*aab c. baa*b*aab d. ba(a+b)*aab

11. What is the weakest precondition for the following assignment statement and postcondition
   a = b/2 – 1 { a< 16 }
   a. {b< 30} b. {b<32} c { b< 34} d. {b>34}

12. Consider the production of a grammar as:

   S → AAA
   A → aa
   A →bb
   A →cc

   Describe the language specified by the production grammar
   a. L = {aaa, abb, baa, ccb}
   b. L = { bbaacc, aaaacc, aabbcc, ababbc}
   b. L = {aabbcc, bbaacc, ccaabb, bbbbbb}
   d. L = {aaaacc, ababab, bbaaca, aaabbb}

A Consider the following grammar
   E → TE'
   E' → +TE' | ε
   T → FT'
   T' → *FT' | ε
   F → (E) | id

Question (13 to 15) are based on the given grammar

13. FIRST(T) is:
   a. { (, id} b. {+,), $} c. {*, ε} d. {+, ε}

14. FOLLOW(F) is:
   a. {+, ε } b. {+,), *,$} c. {*, ε } d. { (, id}

15. FOLLOW(T) is
   a. {+, ε } b. {+,), $} c. {*, ε } d. {), $}

16. _____ are those that are bound to memory cells before program execution begins and remain bound to those same memory cells until program execution terminates.
   a. Stack-dynamic variable
   b. Implicit Heap-Dynamic Variables
   c. Static variables
   d. Instance variables

17. _____ is one in which all of the possible values, which are named constants, are provided and it provides a way of defining and grouping collection of named constants.
   a. Name type equivalence
   b. Structure type equivalence
   c. Overloaded literal
   d. Enumeration types

18. A program has the property of _____ if any two expressions in the program that have the same value can be substituted for one another anywhere in the program, without affecting the action of the program.

a. Referential transparency
b. Operator overloading
c. Coercion
d. Narrowing conversion

19. Converting an 'int' to a 'long' in a Java program is an example of

a. Widening primitive conversions
b. Autoboxing
c. Unboxing
d. Narrowing primitive conversion

20. A _____ is one that can have multiple versions, each version accepting different types of numbers of arguments.

a. Generic sub-program
b. Inline subprogram
c. Overloaded subprogram
d. Recursive subprogram

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SECTION "B"
[6 Q. × 4 = 24 marks]

Attempt ANY SIX questions.

1. Explain in detail what programming language has dominated artificial intelligence over the past 40 years?

2. Define static, stack-dynamic, explicit heap-dynamic and implicit heap-dynamic variables.

3. What are the design issues for array? Define ordinal, enumeration and subrange types.

4. Explain about short-circuit evaluation. Name a language that always does short-circuit evaluation of Boolean expressions. Name one that never does it. Name one in which the programmer is allowed to choose.

5. Differentiate between pretest and posttest loop statement. Also write the design issues for selection structure.

6. What are the advantages and disadvantages of keyword parameters? Also illustrate the design issues for subprogram.

7. Explain about an activation record, an activation record instance, nested subprograms and blocks.

SECTION "C"
[2 Q. × 8 = 16 marks]

Attempt ANY TWO questions.

8. a. Describe about different types of axiomatic semantics in detail.
   b. Explain about ambiguous grammar. Prove that the following grammar is ambiguous. [5+1+2]

   < S > → <A>
   < A > → <A> + <A> | < id >
   < id > → a | b | c

9. What are the advantages of LR parser?
   Consider the following grammar

   E → T | E + T
   T → F | T*F
   F → id | (E)

   Construct the LR parse table and show the complete parse including the stack contents, input string and action for the string *id+id*id* [2+3+3]

10. Explain in detail about the reasons for studying concepts of programming languages? Also write an evaluation of some programming language you know.