KATHMANDU UNIVERSITY
End Semester Examination [C]
November, 2018

Marks scored:

Level : B.Sc.
Year : IV

Course : COMP 409
Semester: I

Exam Roll No.:

Time: 30 mins.

F.M. : 10

Registration No.:

Date NOV 18 2018

SECTION "A"
[20 Q.×0.5=10 marks]

Tick (√) the most appropriate answer.

1. A compiler that translates source code into hardware instruction is called
   [a] Native Code Compiler
   [b] JIT Compiler
   [c] Pure Interpreter
   [d] Virtual Machine Compiler

2. In a compiler, grammar of the programming is checked during
   [a] Code optimization
   [b] Code generation
   [c] Semantic analysis
   [d] Syntax analysis

3. What is the output of lexical analyzer?
   [a] A parse tree
   [b] Intermediate code
   [c] A list of tokens
   [d] Machine code

4. In some programming languages, an identifier is permitted to be a letter followed by any number of letters or digits. If L and D denotes the sets of letters and digits respectively, which of the following expressions define an identifier?
   [a] (L U D)* [b] L(L U D)* [c] (L . D)* [d] L .(L.D)*

5. The language which is generated by the grammar S → aSa | bSb | a | b over the alphabet {a,b} is the set of
   [a] All odd length palindromes
   [b] All even length palindrome
   [c] String that begins and end with the different symbol
   [d] All odd and even length palindromes

6. When is the type checking usually done?
   [a] During syntax directed translation
   [b] During lexical analysis
   [c] During code optimization
   [d] During syntax analysis

7. A shift reduce parser carries out the actions specified within braces immediately after reducing with the corresponding rule of grammar
   S → xxW (PRINT "1")
   S → y (PRINT "2")
   W →Sz (PRINT "3")
   What is the translation of xxxxyzz using the syntax directed translation scheme described by the above rules?
   [a] 23131 [b] 23132 [c] 11233 [d] 33211

8. For predictive parsing the grammar $A \rightarrow AA \mid (A) \mid \varepsilon$ is not suitable because
[a] The grammar is right recursive
[b] The grammar is ambiguous
[c] The grammar is left recursive
[d] The grammar is operator grammar

9. **S→ S*E**
S→ E
E→ F+E
E→ F
F → id
Corresponding to the above grammar, we have following LR (0) items.
a. S→ S*E
b. E→ F.+E
c. E→ F+.E
The two items that will appear in the same set in the canonical sets-of-items for the grammar is
[a] a and b [b] a and c [c] b and c [d] a, b and c

Consider the following grammar
E → TE'
E' → +TE' | ε
T → FT'
T' → *FT' | ε
F → (E) | id
Question (10 to 11) are based on the given grammar

10. FIRST(E) is:
[a] {+, ε} [b] {+,), $} [c] {*, ε } [d] { (, id}

11. FOLLOW(T) is:
[a] {+, ε } [b] {+,), $} [c] {*, ε } [d] { (, id}

12. Shift reduce parser announces successful completion of parsing if action is
[a] Shift [b] Reduce [c] Accept [d] Error

13. A parse tree showing the value of attributes at each node is
[a] Annotated parse tree [b] Syntax tree
[c] Semantic tree [d] Phrase marker

14. Consider node for production **T → T1*F,** so the T.val at this node is defined by
[a] T.val := T1.val * F1.val [b] T.val := T.val * F.val
[c] T.val := T.val * F.val [d] T.val := T1.val * F.val

15. Flow of control in a program corresponds to which traversal of activation tree?
[a] Breadth first traversal [b] Depth first traversal
[c] Postorder traversal [d] Inorder traversal

16. Information needed by a single execution of a procedure is managed using a contiguous block of storage called
[a] Control link
[b] Access link
[c] Activation record
[d] Temporaries

17. A directed graph that contains attributes as nodes and dependencies across attributes as edges is
[a] Dependency graph
[b] Hamiltonian graph
[c] Sub-graph
[d] Parse tree

18. Which of the following symbol table operation returns a pointer to the entry in the table for name by following linked table
[a] enter(table,name,tyoe,offset)
[b] addwidth(table,width)
[c] enterproc(table,name,newtable)
[d] lookup(table, name)

19. How many operator are there on the right side of the statement in there-address code.
[a] Only one [b] Two [c] Three [d] Four

20. Determination of exactly which register to place a given variable is called
[a] Register allocation
[b] Register assignment
[c] Memory allocation
[d] Variable assignment

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SECTION "B"
[6 Q.×4=24 marks]

Attempt *ANY SIX* questions.

1. A compiler uses a two-pass scheme of translation, performing analysis of the source program in the first pass, and synthesis of the target program in the second pass. Clearly explain what use is made of the symbol table in the two passes of the compiler.

2. State the algorithm to construct an NFA from a given regular expression. Construct NFA for the regular expression
   (a | b)*ab*a(a | b)

3. Construct the LL(1) parsing table for following grammar and trace for [{()}].
   $S \rightarrow [A]\ S \mid \varepsilon$
   $A \rightarrow \{B\}\ A \mid \varepsilon$
   $B \rightarrow (\ )\ B \mid \varepsilon$

4. Differentiate between recursive decent parsing and non recursive predictive parsing.

5. What do you mean by left recursive grammar? Remove the left recursion in the following grammar.
   $E \rightarrow E+T \mid T$
   $T \rightarrow T * F \mid F$
   $F \rightarrow id \mid (E)$

6. What is type checking? Explain about static and dynamic type checking.

7. Write short notes on
   a. Dead code elimination
   b. Error handling technique
   c. Activation tree
   d. Three-address code

SECTION "C"
[2 Q.×8=16 marks]

Attempt *ANY TWO* questions.

8. Consider the grammar
   $A \rightarrow a\ Aa$
   $A \rightarrow b\ A\ b$
   $A \rightarrow \varepsilon$
   a. Describe the language that the grammar defines.
   b. Is the grammar ambiguous? Justify your answer.
   c. Construct a SLR parse table for the grammar.
   d. Can the conflicts in the table be eliminated?

9. Construct the LR(1) parsing table for the following grammar

$S \rightarrow L=R$
$S \rightarrow R$
$L \rightarrow *R$
$L \rightarrow id$
$R \rightarrow L$

10. Consider the following grammar and give the syntax directed definition to construct parse tree. For the input expression 5*3+4*9, construct an annotated parse tree along with dependency graph according to your syntax directed definition.

$E \rightarrow TE'$
$E' \rightarrow +TE'$
$E' \rightarrow \varepsilon$
$T \rightarrow FT'$
$T' \rightarrow *FT'$
$T' \rightarrow \varepsilon$
$F \rightarrow digit$