Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
June, 2018

Level: B.E./B.Sc.
Year : III/IV
Course : COMP 409
Semester : II/I

Exam Roll No. :
Time: 30 mins.
F. M. : 10

Registration No.:
Date JUN 11 2018

SECTION "A"
[20 Q. × 0.5 =10 marks]

Tick (√) the correct answer(s) or fill in the blanks with most appropriate word/phrase.

1. Two parts to compilation are
   a) Single-pass, Multipass
   b) Analysis and Synthesis
   c) Load-and-go and Debugging
   d) Optimizing and Synthesis

2. 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

3. ----------, in which certain checks are performed to ensure that the components of a program fit together meaningfully.
   a) Hierchical Analysis
   b) Linear Analysis
   c) Semantic analysis
   d) Syntax Analysis

4. What is the output of syntax analyzer?
   a) A parse tree
   b) Intermediate code
   c) A list of tokens
   d) Machine code

5. The regular expression having all strings in which any number of 0's is followed by any number of 1's followed by any number of 2's is:
   a) (0+1+2)* b) 0*1*2* c) 0* + 1 + 2 d) (0+1)*2*

6. The regular expression to denote a language L which accepts all the strings which begin or end with either 00 or 11 is ?
   a) [(00(0+1)*11] + [11(0+1)*00]
   b) [(00+11)(0+1)$^{+}$] + [(0+1)+(00+11)]
   c) [(00+11)(0+1)*]+[(0+1)*(00+11)]
   d) (00+11)(0+1)*(00+11)

7. Consider the production of a grammar as:
   S → AA
   A→aa
   A →bb
   Describe the language specified by the production grammar
   a) L = {aaaa, aabb, bbaa, bbbb}
   b) L = { abab, abaa, aaab, baaa}
   c) L = {aaab, baba, bbaa, bbbb}
   d) L = {aaaa, abab, bbaa, aaab}

8. In the class of LR(k) grammar, LR(k) means
   a) Left to right scan, Right most derivation, no input symbol lookahead.
   b) Left to right scan, Left most derivation, k input symbols lookahead.
   c) Left to right scan, Right most derivation, k input symbols lookahead.
   d) Left to right scan, Right most derivation in reverse, k input symbols lookahead

9. 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

10. Items are used in
   a) Shift reduce parser
   b) Predictive parsing
   c) Recursive descent parsing
   d) LR parsing

Consider the following grammar

$E \rightarrow TE'$
$E' \rightarrow +TE' \mid \varepsilon$
$T \rightarrow FT'$
$T' \rightarrow *FT' \mid \varepsilon$
$F \rightarrow (E) \mid id$

Question (11 to 13) are based on the given grammar

11. FIRST(E') is:
   a) {+, ε} b) {+,), $} c) {*, ε } d) { (, id}

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

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

14. An S-attributed definition can be implemented during
   a) Top-down parsing
   b) Bottom-up parsing
   c) Recursive descent parsing
   d) Breadth First Traversal.

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

16. DAG representation of a basic block allows:
   a) Automatic detection of loop invariant
   b) Automatic detection of induction variables
   c) Automatic detection of local common sub-expression
   d) Automatic detection of dead code

17. An intermediate code form is
   a) Postfix notation
   b) Syntax tree
   c) Three address code
   d) All of these

18. Which of the following is not a loop optimization?
    a) Copy propagation
    b) Loop fusion
    c) Loop unrolling
    d) None of these

19. In Syntax directed translation we associate _____ to the grammar
    a) Syntax
    b) Attribute
    c) Semantic
    d) Production

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

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SECTION "B"
[6 Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

1. What do you mean by compiler? Explain different steps in synthesis phase.

2. Write the step involved to convert NFA into its equivalent DFA. Convert the given NFA into its equivalent DFA.

δ	ε	0	1
→q_0	q_1	Φ	Φ
q_1	Φ	q_2	q_3
q_2	Φ	q1	$\{q_1,q_4\}$
q_3	q_2	q_4	Φ
*q_4	Φ	Φ	Φ

3. Write the steps involved in shift-reduce parsing. Design Shift-reduce parser for the following grammar G using the input string w = bacab
G: S →aSa | bSb | c

4. Consider the following piece of code:

```
c = 10;
a = c;
i = j = 0;
while(i != (a*3))
{
        if (j) print("Hello");
        i++;
        d[i] = 10*i;
        b = 5 * I;
}
```

Identify different kinds of optimizations possible. Rewrite the code after making optimized.

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

6. Define between s-attributed and l-attributed grammar. Also explain the role of dependency graph in semantic analysis with suitable example.

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

8. Write short notes on
   a) Dead code elimination
   b) Attribute Grammar
   c) Activation tree
   d) Common Sub Expression Elimination

SECTION "C"

[2 Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

9. Consider the following grammar:
   S →SAa | SBb | a | b
   A → b
   B → a

   Construct the predictive top down parsing table. Test whether the string w = baab is valid or not.

10. Construct the LR(1) parsing table for the following grammar
   S → L=R
   S → R
   L → *R
   L →id
   R → L

11. 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 → TE'
   E' → +TE'
   E' →ε
   T → FT'
   T'→ *FT'
   T' →ε
   F → digit