

KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2016

Marks Scored:

Level : B. Sc.

Year : III

Course : COMP 409

Semester: II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date :

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Encircle the alphabetical letter of the most appropriate answer.

1. Which of the following cannot be applied in Computational Technology?:
 - a. Binary translation
 - b. Hardware synthesis
 - c. DB query interpreters
 - d. Computational analysis
2. When a computer is first turned on or restarted, a special type of absolute loader is executed which is called:
 - a. Boot loader
 - b. "Compile and Go" loader
 - c. **Boot strap loader**
 - d. Relating loader
3. In some programming language, an identifier is permitted to be a letter followed by any number of letters or digits. If L and D denote sets of letters and digits respectively, then which of the following defines identifier?
 - a. $(LUD)^*$
 - b. $L(LUD)^*$
 - c. $(L.D)^*$
 - d. **$L.(L.D)^*$**
4. Given the following two statements:
 - i. A DFA can simulate the behavior of NFA by increasing the number of states
 - ii. Any NFA is a more general machine without being more powerfulWhich of the following is true?
 - a. Only i
 - b. Only ii
 - c. Both i and ii
 - d. Both are incorrect
5. Besides reading source text, the lexical analyzer also performs certain secondary tasks at the user interface. They are:
 - a. Stripping out from the source program comments and white spaces in the form of blank, tab and new line characters
 - b. Correlating error messages from the compiler with the source program
 - c. If the source language supports some macro pre-processor functions, then these preprocessor functions may also be implemented as lexical analysis takes place
 - d. All of the above
6. Token is a sequence of characters that can be treated as a _____.
 - a. Single logical entity
 - b. Multiple logical entity
 - c. Single physical entity
 - d. Multiple physical entity

7. A shift reduce parser carries out the action specified within braces immediately after reducing with the corresponding rule of the grammar
 $S \rightarrow xxS \quad \{\text{Print "Test"}\}$
 $S \rightarrow y \quad \{\text{Print "Print"}\}$
 $S \rightarrow Sz \quad \{\text{Print "Hello"}\}$
 What is the translation of xxxxyzz using the syntax directed scheme described by the above rule?
 a. Print Test Test Hello Hello b. Print Hello Hello Test Test
 c. Print Hello Test Hello Test d. Print Test Hello Test Hello
8. LR parser is effective because
 i. It doesn't back track
 ii. It can be constructed to recognize CFG corresponding to almost all programming constructs
 Which of the following is true?
 a. Only i b. Only ii c. Both i and ii d. Both are incorrect
9. Look aheads are used in :
 a. SLR parsing b. CLR parsing c. LALR parsing d. Both (b) and (c)
10. The stack of SLR parser holds:
 a. Non-terminals of the grammar b. Terminals of the grammar
 c. States of LR(0) automation d. Items of the grammar
11. An L-attributed definition can be implemented during :
 a. Top-down parsing b. Bottom up parsing
 c. Recursive descent parsing d. Breadth first traversal

Question (12-15) are based upon the following grammar G:

G:
 $S \rightarrow FR$
 $R \rightarrow *S \mid \epsilon$
 $F \rightarrow id$

12. Which one of the following strings is generated by the grammar above?
 a. $id*id*$ b. $*id$ c. $**id$ d. $id*id*id$
13. For the correct answer in question 12, how many steps are required to derive the string from S and how many parse tree are there?
 a. 6 and 1 b. 9 and 1 c. 7 and 2 d. 9 and 2
14. The number of states in SLR automation for G is:
 a. 5 b. 6 c. 7 d. 8
15. In the predictive parsing table M, the grammar entries $M[S, id]$ and $M[R, \$]$ respectively are
 a. $\{S \rightarrow FR\}$ and $\{R \rightarrow \epsilon\}$ b. $\{S \rightarrow FR\}$ and error
 c. $\{S \rightarrow FR\}$ and $\{R \rightarrow *S\}$ d. $\{F \rightarrow id\}$ and $\{R \rightarrow \epsilon\}$

16. A given grammar is called ambiguous if:
 - a. two or more productions have the same non-terminal on the left hand side
 - b. a derivation tree has more than one associated sentence
 - c. there is a sentence with more than one derivation tree corresponding to it
 - d. brackets are not present in the grammar

17. SLR parser can observe shift reduce conflict because of:
 - a. Trying to reduce in all the symbol of FOLLOW(A)
 - b. Trying to reduce in all the symbol of FIRST(A)
 - c. Trying to shift in all the symbol of FIRST(A)
 - d. Trying to shift in all the symbol of FOLLOW(A)

18. Phrase level recovery does not perform which of the following?
 - a. Deletion of a source symbol i.e., delete an extra semicolon
 - b. Insertion of a synthetic symbol i.e., to insert a missing semicolon
 - c. Replacement of a source symbol by synthetic symbol
 - d. Changing of the type

19. Given a grammar G:

$S \rightarrow Bc \mid DB$
 $B \rightarrow ab \mid cS$
 $D \rightarrow d \mid \epsilon$

The FOLLOW(S), FOLLOW(B) and FOLLOW(D) are:

a. {a,c}, {c,\$}, {b,\$}	b. {c,\$}, {c,\$}, {a,c}
c. {b,\$}, {c,\$}, {a,b}	d. {a,\$}, {b,\$}, {c,\$}

20. Which of the following is incorrect for data optimization?

a. Variable propagation	b. Dead code elimination
c. Induction variable elimination	d. Common sub-expression elimination

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SECTION "B"

[6Q × 4 = 24 marks]

Answer *ANY SIX* questions. Candidates are encouraged to elaborate the answer in a conceptual way. Each answer should reflect the best possible understanding to the given question.

1. Define bootstrapping. Explain with suitable example how bootstrapping is done on more than one machine. [1+3]
2. Describe the task performed by following programs [4 × 1 = 4]
 - i. Preprocessors
 - ii. Assemblers
 - iii. Loaders and link-editors
 - iv. Error Handler
3. Construct a DFA from the given augmented regular expression [4]
 $r\# = (a+b)^* a b b (a+b)^* a b \#$
4. Explain: (i) Input Buffering (ii) Symbol table implementation [2+2]
5. Differentiate between S-attributed definition and L-attributed definition. Write semantic rules for simple type declaration. [2+2]
6. Discuss the role of the following data structures that are used for the implementation of three address code with suitable example. [4]
 - i. Quadruples
 - ii. Triplets
 - iii. Indirect Triplets
7. Explain the need of optimization. Describe following optimization technique with example [1+1+1+1]
 - i. Copy Propagation
 - i. Loop Invariant code motion
 - ii. Loop unrolling

SECTION “C”
[2Q × 8 = 16 marks]

Answer *ANY TWO* questions.

8. Given a LL(1) grammar G for Boolean expression : [8]

G:

B → **B or T** | **T**

T → **T and F** | **F**

F → **not B** | **(B)** | **true** | **false**

Answer the followings:

- i. Transform G into an equivalent LL(1) grammar G'
 - ii. Compute FIRST and FOLLOW for each non terminals
 - iii. Construct a predictive parsing table for G'
 - iv. Show how your predictive parser processes the input string
true and not false or true
 - v. Draw the parse tree traced out by your parser
9. Show that the following grammar is LR(1) but not LALR(1) [5+3]

$S \rightarrow Aa$

$S \rightarrow bAc$

$S \rightarrow Bc$

$S \rightarrow bBa$

$A \rightarrow d$

$B \rightarrow d$

10. a. Consider the following Syntax Directed Translation Scheme (SDTS): [4]

$E \rightarrow E_1 * T$ (E.val = $E_1.val * T.val$)

$E \rightarrow T$ (E.val = T.val)

$T \rightarrow T_1 - F$ (T.val = $T_1.val - F.val$)

$T \rightarrow F$ (T.val = F.val)

$F \rightarrow 2$ (F.val = 2)

$F \rightarrow 4$ (F.val = 4)

Using the above SDTS construct a parse tree for the expression 4-2-4*2. Also compute its E.val and show the dependency graph.

- b. Consider the following code fragment: [4]

while(A<C and B>D)

do if A = 1 then c = c+1

else

while A<=D

do A = A + B

Write a three address code by representing them in the quadruple data structure.