

**COL728 Minor1 Exam**  
**Compiler Design**  
**Sem II, 2016-17**

Answer all 5 questions

Max. Marks: 20

1. Short questions
  - a. Show that every regular language is also a context-free language [2]

b. Why does the lexer use regular languages but the parser use context-free languages? Explain both reasons briefly and clearly, i.e., (1) why does the lexer use regular languages, and (2) why does the parser use context-free languages. [2]

2. Consider the following grammar:

$E \rightarrow \text{if } E \text{ then } E$

$E \rightarrow \text{if } E \text{ then } E \text{ else } E$

$E \rightarrow \text{id}$

- a. Show that this grammar is ambiguous [2]

b. Write an alternative grammar that accepts the same language but is not ambiguous. Clearly state the rule that you used to resolve the ambiguity (any rule that resolves ambiguity is okay). [3]

3. Consider the following grammar:

$E \rightarrow id$

$E \rightarrow (E)$

$E \rightarrow E.E$

Run the recursive descent parsing algorithm (with backtracking) on the following input:

(id)(id)

Clearly and concisely show the steps and the final result. No marks for partial or incorrect execution [4]



4. Consider the following grammar, and answer the following questions clearly.

$E \rightarrow \text{id}$

$E \rightarrow (E * E)$

$E \rightarrow (E + E)$

a. Is this grammar LL(1)? [2]

b. Is this grammar SLR? [4]



5. Give an example of a program (in a programming language of your choice) that is a correct program as far as the parser is concerned (i.e., the parser accepts that program as a valid program), but is not a correct program otherwise (i.e., the semantic analysis step would discard the program as invalid). [1]

