

**III B.Tech II Semester Supplementary Examinations,
November/December 2005
LANGUAGE PROCESSORS
(Computer Science & Engineering)**

Time: 3 hours**Max Marks: 80**

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) What is the role of lexical analyzer. [6]
(b) Construct an NFA for the regular expression $R=(a+b)^*abb$ convert it in to an equivalent DFA. [10]
2. (a) Distinguish between simple precedence and operator precedence parsing techniques. [6]
(b) Construct simple precedence parse table for the following grammar.
 $E \leftarrow E + T | T$
 $T \rightarrow T * F | F$
 $F \rightarrow (F) | id$ [10]
3. Construct canonical LR pars table for the following grammar.
 $S \rightarrow L = R$
 $S \rightarrow L$
 $L \rightarrow^* R$
 $R \rightarrow L$ [16]
4. Write type expression for the following types
 - (a) An array of pointers to real, where the array index ranges from 1 to 100. [5]
 - (b) A two dimensional array of integers (i.e an array of arrays) whose rows are indexed from 0 to 9 and whose columns are indexed from 10 to 10. [5]
 - (c) Functions whose domains are functions from integers to pointers to integers and whose ranges are records consisting of an integer and a character. [6]
5. (a) What is an activation record? Explain how it is related with run time storage organization. [8]
(b) Write a short notes on heap strategy and run-time storage allocation. [8]
6. (a) What are the various machine dependent code optimization techniques. [8]
(b) Convert the following arithmetic expression into syntax tree and three address code
 $b * 3 (a+b)$ [8]

7. (a) Augment the code generation algorithm to incorporate the following features. [8]
- i. The parenthesis in an expression
 - ii. Non commutative operators like '-' and '/' etc
- (b) Show various steps in the code generation algorithm of the expression
 $(a + b) / (c + d)$
Assuming two machine registers to be available. [8]
8. (a) Write the design specification for a parameter in macro statement. [6]
- (b) What is meant by Expansion time Variable (EV). Write the syntax of two forms of Expansion time variable. [5]
- (c) How the value of EV can be manipulated through the preprocessor statement SET. Explain with an example. [5]

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1. Explain with one example how LEX program perform lexical analysis for the following patterns in C : identifier, comments, numerical constants, arithmetic operators. [16]
2. (a) Distinguish between simple precedence and operator precedence parsing techniques. [6]
 (b) Construct simple precedence parse table for the following grammar.

$$E \leftarrow E + T \mid T$$

$$T \rightarrow T * F \mid F$$

$$F \rightarrow (F) \mid id$$
 [10]
3. (a) What are S-attributed and L-attributed grammars.
 (b) Write a S-attributed grammar to connect the following grammar with prefix rotater

$$L \rightarrow E$$

$$E \rightarrow E + T$$

$$E \rightarrow E - T$$

$$E \rightarrow T$$

$$T \rightarrow T * F$$

$$T \rightarrow T / F$$

$$T \rightarrow F$$

$$F \rightarrow P \uparrow F$$

$$F \rightarrow P$$

$$P \rightarrow (E)$$

$$P \rightarrow id.$$
 [6+10]
4. (a) List out some typical semantic errors . Explain how they can be rectified? [8]
 (b) What is static checking ? Give some examples of static checks. [8]
5. (a) Write a notes on the static storage allocation strategy with examples and discuss its limitations. [8]
 (b) Discuss about the static allocation strategy of run-time environment with examples. [8]
6. (a) Explain with an example how abstract machine code can be generated for a given if-then-else statement. [8]

- (b) Write a short notes on peephole optimization. [8]
- 7. (a) Define Address Descriptor and Register Descriptor. [4]
- (b) Why Next-use information is required for generating Object code? [6]
- (c) What are the various object code forms. [6]
- 8. (a) List out the data structure to perform Macro Expansion. [8]
- (b) Write an algorithm for Macro processing. [8]

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1. (a) Explain lexical analysis in detail. [8]
 (b) What are the reasons for separating lexical analysis from syntax analysis. [8]
2. (a) Explain the reasons for separating lexical analysis phase from syntax analysis. [6]
 (b) Eliminate ambiguities from the following grammar
 $S \rightarrow iEtSeS|iEtS|a$
 $E \rightarrow b|c|d$ [10]
3. (a) What are S-attributed and L-attributed grammars.
 (b) Write a S-attributed grammar to connect the following grammar with prefix rotater
 $L \rightarrow E$
 $E \rightarrow E+T$
 $E \rightarrow E-T$
 $E \rightarrow T$
 $T \rightarrow T * F$
 $T \rightarrow T / F$
 $T \rightarrow F$
 $F \rightarrow P \uparrow F$
 $F \rightarrow P$
 $P \rightarrow (E)$
 $P \rightarrow id.$ [6+10]
4. (a) Write a note on the specification of a Simple type checker. [8]
 (b) Explain the equivalence of type expressions with appropriate examples. [8]
5. (a) What are the advantages and disadvantages of static storage allocation strategy. [8]
 (b) What are the advantages and disadvantages of heap storage allocation strategy? [8]
6. (a) Give a translator grammar for converting boolean expression into three address code. [8]
 (b) Apply the translation scheme on the following expression $a < b$ or $c < d$ and $e < f$. [8]

7. (a) Explain the generic issues in the design of code generator. [8]
(b) Write about the various object code forms. [8]
8. (a) Explain the memory requirement for variant I and variant II of intermediate code of an assembler design. [8]
(b) How Declarative state and Assembler directives are processed by an assembler. [8]

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1. Suppose we have the sequence of auxiliary definitions

$$A_0 = a/b$$

$$A_1 = A_0A_0$$

$$A_2 = A_1A_1$$

$$\vdots$$

$$A_n = A_{n-1}A_{n-1}$$
 Followed by the pattern A_n .
 - (a) Informally describe the set of strings denoted by the pattern (as a function of n) [6]
 - (b) If we substitute out all auxiliary definitions in the pattern, how long is the regular expression [5]
 - (c) Show that $2^n + 1$ states are necessary for any NFA recognize A_n . [5]
2. (a) The grammar $S \rightarrow aSa|aa$ generates all even length string of a's except for the empty string. If a brute force method of top down parser is used, it succeeds of 2a's, 4a's, 8a's but fails on 6a's. Find out all even strings for which the parser succeeds. [8]
- (b) List out the rules for constructing the simple precedence table for a CFG. [8]
3. Construct canonical LR pars table for the following grammer.

$$S \rightarrow L = R$$

$$S \rightarrow L$$

$$L \rightarrow^* R$$

$$R \rightarrow L$$
 [16]
4. (a) List out some typical semantic errors . Explain how they can be rectified? [8]
- (b) What is static checking ? Give some examples of static checks. [8]
5. (a) What is an activation record? Explain how it is related with run time storage organization. [8]
- (b) Write a short notes on heap strategy and run-time storage allocation. [8]
6. (a) What are loop invariant components. Explain how they effect the efficiency of a program. [8]
- (b) Compare various forms of three address code. [8]

7. (a) What is a flow graph. Explain how flow graph can be constructed for a given program. [10]
(b) Compare the various forms of three address code. [6]
8. (a) List out the data structure to perform Macro Expansion. [8]
(b) Write an algorithm for Macro processing. [8]
