

III B.Tech. II Semester Regular Examinations, April/May -2005**LANGUAGE PROCESSORS
(Computer Science & Engineering)****Time: 3 hours****Max Marks: 80**

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

1. (a) Write regular expressions and NFA for the following patterns. Use auxiliary definitions where convenient.
 - i. The set of words having a,e,i,o,u appearing in that order , although not necessarily consecutively.
 - ii. Comments as in C.(b) What is the difference between pass and a phase.
2. (a) Distinguish top down and bottom up parsing.
(b) Construct a recursive Descent parser for the following grammar.
 $E \rightarrow E + T | T$
 $T \rightarrow TF | F$
 $F \rightarrow F^* | a | b$
3. Construct LALR parse table for a following grammar
 $S \rightarrow Aa | bAc | Bc | bBa$
 $A \rightarrow d$
 $B \rightarrow d$.
4. (a) Which of the following recursive type expressions are equivalent ? Justify your answer?
 $e1 = \text{integer} \rightarrow e1$ $e2 = \text{integer} \rightarrow (\text{integer} \rightarrow e2)$ $e3 = \text{integer} \rightarrow (\text{integer} \rightarrow e1)$
(b) Suppose that the type of each identifier is a sub range of integers for expressions with the operators +, -, *, div and mod as in pascal. Write type checking rules that assign to each sub expression, the sub range its value must lie in.
5. (a) What is an activation record? Explain how it is related with run time storage organization.
(b) Write a short notes on heap strategy and run-time storage allocation.
6. (a) What are the various machine dependent code optimization techniques.
(b) Convert the following arithmetic expression into syntax tree and three address code
 $b^* - (a + b)$

7. Generate code for the following statements for the target machine (Target Machine is a byte addressable machine with four bytes to a word and N general purpose registers.) Assuming all variables are static. Assume 3 registers are available.
- (a) $x = a[I] + 1$
 - (b) $a[I] = b[c[I]]$
 - (c) $a[I][J] = b[I][k] * c[k][J]$
 - (d) $a[I] = a[I] + b[J]$
8. (a) Explain how lexical substitution is performed for model statements by a macro preprocessor.
- (b) Differentiate Positional and keyword parameter.
- (c) How the value of the positional and keyword parameter is determined? Explain with an example.

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1. (a) Write about lexical analyzer generator.
(b) Construct minimumstate DFAs for the following regular expressions.
 - i. $(a/b)^* a (a/b)$
 - ii. $(a/b)^* a (a/b) (a/b)$
 - iii. $(a/b)^* a (a/b)(a/b)(a/b)$.
2. (a) Eliminate ambiguities for the following grammar.
 $S \rightarrow iEtS|iEtSeS|a$
 $E \rightarrow b|c|d$
(b) Construct operation precedence parse table for the above expressions.
3. (a) Give a syntax-directed translator scheme for converts the statements of the following grammar into three address code
 $S \rightarrow \text{while } \text{expr } \text{do } \text{begin } S \text{ and}$
 $|S; S$
 $|break$
 $|other$
(b) Explain the translator process using suitable example.
4. (a) What are the advantages and disadvantages of Structural equivalence. Explain through example.
(b) What are the advantages and disadvantages of Name equivalence. Explain through examples.
5. (a) Write a notes on the static storage allocation strategy with examples and discuss its limitations.
(b) Discuss about the stack allocation strategy of run-time environment with examples.
6. (a) Explain with an example the abstract machine code form of Intermediate code.
(b) Give a detailed account on loop optimisator techniques.
7. (a) Explain the generic issues in the design of code generator.
(b) Write about the various object code forms.

8. (a) Explain how lexical substitution is performed for model statements by a macro preprocessor.
- (b) Differentiate Positional and keyword parameter.
- (c) How the value of the positional and keyword parameter is determined? Explain with an example.

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1. (a) What are the basic functions of language translator.
(b) Distinguish pass and a phase of a compiler.
2. (a) The grammar $S \rightarrow aSa|aa$ generates all even length strings of a's except for the empty string-show that the prete free method of top down parsing succeeds of 2,4 and 8a's but fails on 6a's. Also find out what are the even strings that are passed by the technique.
(b) What is an 22(1) grammar. Can you convert every context free grammar into LL(1).
3. (a) Define LR(0) grammer.
(b) Construct SLR passing table for the following grammar.
 $E \rightarrow E + T/T$
 $T \rightarrow TF/F$
 $F \rightarrow F^*|a|b$.
4. (a) What is type-graph? How cycles are represented in type- graph? Give example.
(b) Give a detail analysis on generic function and polymorphic function.
5. (a) Write a notes on the static storage allocation strategy with examples and discuss its limitations.
(b) Discuss about the stack allocation strategy of run-time environment with examples.
6. (a) Explain with an example how abstract machine code can be generated for a given if-then-else statement.
(b) Write a short notes on peephole optimization.
7. (a) Augment the code generation algorithm to incorporate the following features.
 - 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. Briefly explain the functions performed during Synthesis and Analysis phase of an assembler design.

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1. (a) Write regular expressions and NFA for the following patterns. Use auxiliary definitions where convenient.
 - i. The set of words having a,e,i,o,u appearing in that order , although not necessarily consecutively.
 - ii. Comments as in C.
- (b) What is the difference between pass and a phase.
2. (a) Construct predictive parse table for the following grammar.
$$E \rightarrow E + T | T$$
$$T \rightarrow TF | F$$
$$F \rightarrow F * | A | B$$
- (b) What are the limitations of recursion descent parser.
3. (a) What are S-attributed and L-attributer grammars.
- (b) Write a S-attributed grammer to connect the following grammer with prefix rotater
$$L \rightarrow E$$
$$E \rightarrow E + T$$
$$E \rightarrow E - T$$
$$E \rightarrow T$$
$$T \rightarrow T * F$$
$$T \rightarrow T / F$$
$$T \rightarrow F$$
$$F \rightarrow P \uparrow F$$
$$F \rightarrow P$$
$$P \rightarrow (E)$$
$$P \rightarrow id.$$
4. (a) Discuss about the overloading of functions and operators with an examples.
- (b) Write a notes on polymorphic functions.
5. (a) What are the contents of a symbol table? Explain in detail.
- (b) What is the data structure used to implement a symbol in an efficient way? Give reasons ?
6. (a) Give a translator grammar for converts boolean expression into three address code.

- (b) Apply the translation scheme on the following expression $a < b$ or $c < d$ and $e < f$.
7. Generate code for the following statements for the target machine (Target Machine is a byte addressable machine with four bytes to a word and N general purpose registers.) Assuming all variables are static. Assume 3 registers are available.
- (a) $x = a[I] + 1$
- (b) $a[I] = b[c[I]]$
- (c) $a[I][J] = b[I][k] * c[k][J]$
- (d) $a[I] = a[I] + b[J]$
8. (a) Write the general format of Macro Prototype statement and Macro call Give an example.
- (b) What is meant by Conditional expansion and Expansion time Loops?
- (c) Define Macro Expansion Counter (MEC). Mention its functions.
