

Mid-Semester Examination(Supplementary-2018)

School of Computer Engineering
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Time: 1.5hrs

Full Mark: 25

(Answer Any five Questions including Q.No.1)

Q1) Answer all questions.

[1×5]

(a) In which phase of the compiler, type checking is performed?

(b) Count the number of tokens in the followings:

(i) `int main()`

```
{  
  int a = 10, b = 20;  
  printf("sum is :%d", a+b);  
  return 0;  
}
```

(ii) `int max(int i);`

(c) Given the following expression grammar:

$X ::= X \oplus Y / Y$

$Y ::= Z * Y / Z$

$Z ::= \text{id}$

What are the precedence and associativity of the operators \oplus and $*$?

(d) Left factor the following grammar.

$\text{rexpr} \rightarrow \text{rexpr} + \text{rterm} \mid \text{rterm}$

$\text{rterm} \rightarrow \text{rterm} \text{rfactor} \mid \text{rfactor}$

$\text{rfactor} \rightarrow \text{rfactor} * \mid \text{rprimary} ,$

$\text{rprimary} \rightarrow a \mid b$

(e) Draw a transition diagram for the token class Relop defined by following regular definition.

$\text{Relop} \rightarrow < \mid <= \mid == \mid != \mid >= \mid >$

Q2) Explain each phase of compiler. Show the output for each phase for the expression $a := b + c * 60$ with a neat and clean diagram of translation of the given statement.

[5]

Q 3) Consider the following Grammar with start symbol S.

$S \rightarrow ABC$

[2.5×2]

$$\begin{aligned} A &\rightarrow aA \mid \epsilon \\ B &\rightarrow bB \mid \epsilon \\ C &\rightarrow cC \mid \epsilon \end{aligned}$$

Construct a parse tree for abbc. Construct a leftmost and rightmost derivation for the string abbc.

Q4)(a) Convert the following regular expression $(ab|ac)^*$ into non-deterministic finite automata.

(b) Convert the NFA to a DFA [2.5×2]

Q5) (a) Write a short note on recursive decent parser. [2]

(b) Consider the following grammar

$$\begin{aligned} A &\rightarrow aBe \mid cBd \mid C \\ B &\rightarrow bB \mid \epsilon \\ C &\rightarrow f \end{aligned}$$

Write down the procedures for the non terminals of the grammar to make a recursive descent parser. [3]

Q6. Given the grammar

[1.5+1.5+2]

$$E \rightarrow E+E \mid E-E \mid E \cdot E \mid E \uparrow E \mid E/E \mid (E) \mid d$$

(a) Convert above grammar to unambiguous grammar.

(b) If result of 6(a) is left recursive, make it non left recursive.

(c) Find the first and follow sets of the result of 6(b).

(Here the operators *, -, +, and / have their usual meanings and $2 \uparrow 3 = 8$ and has highest precedence and is right associative)

Q7. Find FIRST and FOLLOW Set for the following Grammar.

[2.5×2]

$$(i) S \rightarrow ACB \mid Cbb \mid Ba$$

$$A \rightarrow da \mid BC$$

$$B \rightarrow g \mid \epsilon$$

$$C \rightarrow h \mid \epsilon$$

$$(ii) E \rightarrow TE'$$

$$E' \rightarrow +TE' \mid \epsilon$$

$$T \rightarrow FT'$$

$$T' \rightarrow *FT' \mid \epsilon$$

$$F \rightarrow (E) \mid id$$