

GANPAT UNIVERSITY

B. Tech. Semester VII: Computer Engineering / Information Technology

Regular Examination November – December 2015

2CE702/2IT702: Compiler Design

Time: 3 Hours

Total Marks: 70

- Instructions: 1. Figures to the right indicate full marks.
 2. Each section should be written in a separate answer books.
 3. Be precise and to the point in your answer.
 4. Assume necessary data.

Section I

- Que.-1 A Symbol table is necessary for compiler construction, justify your statement with example. 6
 B Write advantages of breaking up whole compiler functionality into front end & back end. 6
 Explain different components of compiler in detail.

OR

- Que.-1 A Eliminate ϵ production from following grammars: 4
- | | |
|-----------------------------------|----------------------------------|
| 1. $P \rightarrow QRST \mid RzSQ$ | 2. $Z \rightarrow TUVX \mid VWU$ |
| $Q \rightarrow pQ \mid \epsilon$ | $T \rightarrow aT \mid \epsilon$ |
| $R \rightarrow yR \mid \epsilon$ | $U \rightarrow b \mid bU$ |
| $S \rightarrow SQx \mid \epsilon$ | $V \rightarrow cV \mid \epsilon$ |
| $T \rightarrow w \mid QRx$ | $W \rightarrow TV$ |
| | $X \rightarrow eX \mid \epsilon$ |
- B Perform left factoring on following grammar: 4
 $A \rightarrow abcde \mid abcdz \mid abce \mid abe \mid ae$
 $S \rightarrow dfgh \mid dfghj \mid dfg \mid df \mid dS$
- C Write the difference between syntax and semantics of the languages, also give the example in C language. 4

- Que.-2 A Construct M-table for following grammar and show the parsing steps for string "prqtqq". 6
 $F \rightarrow pF \mid Gq$
 $G \rightarrow HIJ \mid \epsilon$
 $H \rightarrow rF \mid \epsilon$
 $I \rightarrow sF \mid \epsilon$
 $J \rightarrow tF$
- B Write a code for recursive descent parser for the following grammar and draw a parse tree for string "a*-b*+a" 5
 $E \rightarrow TA$
 $A \rightarrow +TA \mid \epsilon$
 $T \rightarrow FB$
 $B \rightarrow -FB \mid \epsilon$
 $F \rightarrow aC \mid bC$
 $C \rightarrow *C \mid \epsilon$

OR

- Que.-2 A State the problems associated with top-down parsing and also explain the solution to eliminate the problem by using example. 6
 B List out issues of CFG for the programming language and explain working of predictive parser with diagram. 5
- Que.-3 A Find First () and Follow () set for the following grammar, construct predictive parsing table and parse the string "((a-ac)-b+bc)". 6
 $S \rightarrow (SY) \mid a \mid b$
 $X \rightarrow Yb \mid +SY \mid \epsilon$
 $Y \rightarrow -SXYc \mid \epsilon$
- B Consider following grammar: 6
 $bterm \rightarrow bexpr \text{ or } bterm \mid bterm$
 $bterm \rightarrow bterm \text{ and } bfactor \mid bfactor$
 $bfactor \rightarrow \text{not } bfactor \mid (bexpr) \mid \text{logic}$
 $\text{logic} \rightarrow \text{true} \mid \text{false}$
1. What are the terminals, nonterminals and start symbol?
 2. Show the precedence and associativity of each operator.
 3. Check for ambiguity by constructing left most or right most derivation.

Section II

Que.-4 A Construct CLR(1) parsing table for the following grammar:

6

$E \rightarrow E + T \mid T$

$T \rightarrow T * F \mid F$

$F \rightarrow id \mid (E)$

B Check whether following grammar is LALR(1) or not?

6

$D \rightarrow Qa \mid aQc \mid Wc \mid bWa$

$Q \rightarrow d$

$W \rightarrow d$

OR

Que.-4 A Check whether the given grammar is CLR(1) or not?

6

$D \rightarrow H a J \mid J$

$H \rightarrow i J \mid j$

$J \rightarrow H$

B Construct LALR(1) parsing table for the following grammar:

6

$A \rightarrow XaXb \mid YbYa$

$X \rightarrow e$

$Y \rightarrow e$

Que.-5 A Check whether the following grammar is LR(0) or not?

6

$S \rightarrow AS \mid b$

$A \rightarrow SA \mid a$

B Write benefits of using intermediate code generations and also consider the following code fragment and generate the three address code for it.

5

```

1. switch(i + j)
   { case 1: x=x+1;
     case 2: y=y+2;
     default: c=c-1;
   }
2. do{
   x= y + z;
   }while(a<b);
    
```

OR

Que.-5 A Explain error recovery in LR parsing.

4

B Construct SLR(1) parsing table for the following grammar, and also try to remove any kind of conflict in the grammar (if exist) and then parse a string "sfdpdrk":

7

$S \rightarrow sPQk$

$P \rightarrow PbSe \mid f$

$Q \rightarrow RTRr \mid e$

$R \rightarrow d \mid e$

$T \rightarrow p \mid e$

Que.-6 A Answer the following:

9

1. List out code optimization techniques and explain any three.
2. Explain how scope information is represented in symbol table.
3. Differentiate between predictive parser and shift reduce parser.

B What is handle? Consider the following grammar and show the handle for each step of parsing string "id * id + id + id * id".

3

$S \rightarrow S+T \mid T$

$T \rightarrow T * F \mid F$

$F \rightarrow (S) \mid id$

END OF PAPER