

GANPAT UNIVERSITY
M. Tech. Semester III (Computer Engineering)
Regular Examination November – December 2014
3CE302: Compiler Design

Time: 3 Hours

Total Marks: 70

- Instruction:**
1. Figures to the right indicate full marks
 2. Each section should be written in a separate answer book
 3. Be precise and to the point in your answer

Section I

Que.-1

- A Explain lexical analysis phase of a compiler and for a statement $a = a + b * c * 2$, write output of all phases of a compiler. Assume a, b, c are float. 6
- B Do as directed: 3
1. Write a CFG, which generates palindrome string for binary number.
 2. Find the regular expression for the language of all strings that contain either the substring 'aaa' or 'bbb' over $\Sigma \{a, b\}$.
 3. Identify the language generated by the regular expression $R = b^* ab^* ab^*$.
- C What is ambiguity in CFG? Check whether the given grammar is ambiguous or not? 3
- $S \rightarrow iCtS \mid iCtSeS \mid a$
 $C \rightarrow b$

OR

Que.-1

- A Explain front end analysis and back end analysis phases of compiler in detail with example. 6
- B Do as directed: 4
1. Identify left recursion and remove it from following grammar:
 $S \rightarrow AS \mid b$
 $A \rightarrow SA \mid a$
 2. Perform left factoring on following grammar:
 $S \rightarrow T + S \mid T$
 $T \rightarrow U * T \mid U$
 $U \rightarrow (S) \mid V$
 $V \rightarrow 0 \mid 1 \mid \dots \mid 9$
- C Check whether given grammar is LL(1) or not? 2
- $S \rightarrow aSA \mid \epsilon$
 $A \rightarrow bB \mid ff$
 $B \rightarrow bd \mid \epsilon$

Que.-2

- A Construct LR(0) parser for the following grammar: 5
- $S \rightarrow aIjH$
 $I \rightarrow IbSe \mid c$
 $J \rightarrow KLLr \mid \epsilon$
 $K \rightarrow d \mid \epsilon$
 $L \rightarrow p \mid \epsilon$
- And parse the string "acbachedprh" from LR(0) parsing table.

- B $S \rightarrow ABS \mid PQx$
 $A \rightarrow xy \mid m$
 $B \rightarrow bC$
 $C \rightarrow bC \mid e$
 $P \rightarrow pP \mid e$
 $Q \rightarrow qQ \mid e$

For the above grammar:

1. Find First () and Follow ()
2. Construct predictive parsing table
3. Check grammar is LL(1) or not?

OR

Que.-2

- A Construct LR(0) parsing table for the following grammar and check whether it is LR(0) or not? Justify your answer. 5

$S \rightarrow cA \mid ccB$

$A \rightarrow cA \mid a$

$B \rightarrow ccB \mid b$

- B $N \rightarrow AB \mid BA$

$A \rightarrow a \mid CAC$

$B \rightarrow b \mid CBC$

$C \rightarrow a \mid b$

For the above grammar:

1. Find First () and Follow ()
2. Construct predictive parsing table
3. Check grammar is LL (1) or not?
4. Perform string parsing for the string "abbababba" from predictive parsing table.

Que.-3 Do as directed:

- A Construct SLR parsing table for the following grammar and parse the string "(x,((x,x),(x,x)))" using SLR parsing table. 6

$S \rightarrow (L) \mid x$

$L \rightarrow S \mid L, S$

- B Construct operator precedence parsing table for the following grammar: 4

$E \rightarrow E + E \mid E * E \mid id$

And parse the string "id * id + id".

- C Check whether the given grammar is LL (1) or not? 2

$S \rightarrow aBC \mid BC$

$B \rightarrow bC \mid bB \mid e$

$C \rightarrow Bx \mid Cy \mid z$

Section II

Que.-4

A Construct SLR parsing table for the following grammar: 6

$S \rightarrow A)$

$A \rightarrow A, P | (P, P$

$P \rightarrow \{ \text{num}, \text{num} \}$

B Construct LALR parsing table for the following grammar: 6

$D \rightarrow L : T$

$L \rightarrow L, \text{id} | \text{id}$

$T \rightarrow \text{integer}$

OR

Que.-4

A Construct CLR parsing table for the following grammar: 6

$S \rightarrow M + N | N$

$M \rightarrow \%N | \&$

$N \rightarrow M$

B Consider the following grammar: 6

$Z \rightarrow XxXy | YyYx$

$X \rightarrow \epsilon$

$Y \rightarrow \epsilon$

Construct LR(0) parsing table for the given grammar.

Que.-5

A Do as directed: 5

1. Apply loop jamming on the following code fragment and explain it.

```
int i, a[100], b[100];
```

```
for (i = 0; i < 100; i++) {
```

```
    a[i] = 1;
```

```
}
```

```
for (i = 0; i < 100; i++){
```

```
    b[i] = 2;
```

```
}
```

2. Apply loop unrolling on the following code fragment and explain it.

```
for (int x = 0; x < 100; x++) {
```

```
    delete(x);
```

```
}
```

B What is a symbol table? Discuss any two data structures suitable for it & compare their merits and demerits. 6

OR

Que.-5

A Explain R-R conflict and S-R conflict of SLR and CLR with example. 5

B List types of errors. Explain types of an error which identified "unmatched string" and "misspelled keywords". 6

Que.-6

A Consider the following code fragment and generate the three address code for it.

6

```
1. if (a < b)
    while (c > d)
        x = x + y;
    else
    do
        p = p + q;
    while (e <= f)

2. for (i=1; i <= 10; i++)
    {
        if (a < b)
            x = y + z;
    }

3. switch(a + b)
    {
        case 1: x=x+1;
        case 2: y=y+2;
        case 3: z=z+3;
        default: c=c-1;
    }
```

B $S \rightarrow uBDz$

$B \rightarrow vB \mid w$

$D \rightarrow EF$

$E \rightarrow y \mid e$

$F \rightarrow x \mid e$

Construct M-Table for the given grammar and show the parsing steps for the string "uvvwyxz".

6

END OF PAPER