



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/M.Tech(CSE)/SEM-3/CSEM-302/2012-13**

**2012**

**COMPILERS**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP – A**

Answer any *five* questions.

5 × 2 = 10

1. Consider the following grammar :

$S \rightarrow AaAB \mid BbBa$

$A \rightarrow \epsilon$

$B \rightarrow \epsilon$

Check the grammar is LL(1) or not.

2. Compute the FIRST and FOLLOW sets for each non-terminal  
of the grammar given below :

$S \rightarrow ABa \mid bCA$

$A \rightarrow cBCD \mid \epsilon$

$B \rightarrow CdA \mid ad$

$C \rightarrow eC \mid \epsilon$

$D \rightarrow bSf \mid a$



3. What is an activation record ? Explain clearly the components of an activation record.

4. Construct DAG for the following code :

$a = a + b$

$e = a + d + e$

5. Define viable prefix.

Given a grammar

$E \rightarrow E + T \mid T$

$T \rightarrow T * F \mid F$

$F \rightarrow id$

which is a set of valid items for a viable prefix  $E+$  .

6. Generate three address code for following 'C' program :

```
main()
{
    int i = 1;
    int a [10];
    while ( i<=10)
    {
        a[i] = 0;
        i++;
    }
}
```



7. Suppose we have the following C declarations :

```
typedef struct {
    int a,b;
} CELL, *PCELL;

CELL foo[100];

PCELL bar(x, y) int x, CELL Y{ }
```

Write type expressions for the types of foo and bar.

### GROUP – B

Answer any *four* questions.

4 × 15 = 60

8. Construct LR(1) parsing table for the following augmented grammar :

```
goal → expr
expr → term + expr
expr → term
term → factor * term
term → factor
factor → id
```

Show LR(1) automaton also.



9. a) Given grammar :

- 1)  $L \rightarrow E n$
- 2)  $E \rightarrow E_1 + T$
- 3)  $E \rightarrow T$
- 4)  $T \rightarrow T_1 * F$
- 5)  $T \rightarrow F$
- 6)  $F \rightarrow (E)$
- 7)  $F \rightarrow \text{digit.}$

Write down syntax directed definition for the given grammar where  $n$  is the end marker of the input string. In the SDD, each of the non-terminals has a single syntax attribute, called val. The terminal digit has a synthesized attribute lexval which is an integer value returned by the lexical analyzer.

b) For the above SDD give annotated parse trees of the following expr

$$(3 + 4) * (5 + 6) n$$

c) How to determine an evaluation order for the attribute instances in a given parse tree. Explain with example.

$$3 + 6 + 6$$



10. a)

Fact(x)

```
{
    int f = 1;
    for ( i = 2; i <= x ; i ++ )
    {
        f = f * i;
    }
    return (f);
}
```

Write down three address code for the above program.  
Partition the code into basic blocks and construct the flow graph.

b) Construct DAG for the following basic block.

d := b \* c

e := a + b

b := b \* c

a := e - d

c) Explain structure-preserving transformations and algebraic transformations of basic blocks using examples.

6 + 6 + 3



11. a) Generate code for the following expression :

$$x = ( a + b ) - (( c + d ) - e )$$

- b) switch ( a + b )

```
{  
    case 1: { x = y + z; break; }  
    default : { p = q + r; }  
    case 2: { u = v + w; break; }  
}
```

Write down three address representation of the above code segment.

- c) Construct LL(1) parsing table for the following grammar :

$$S \rightarrow A$$

$$A \rightarrow aB | Ad$$

$$B \rightarrow bBC | f$$

$$C \rightarrow g$$

$$6 + 4 + 5$$

12. Construct SLR parsing table for the given grammar. Also check acceptability of the input string:abbcbcde#[# is the endmarker]

$$S \rightarrow aABe$$

$$A \rightarrow Abc$$

$$A \rightarrow b$$

$$B \rightarrow d$$



13. Write short notes on the folloiwng :

3 × 5

- a) YACC
- b) Symbol table
- c) Storage allocation strategies.

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