B.E. (Information Technology) Semester Seventh (C.B.S.)

# Elective - I : Compiler Design

P. Pages : 3 **KNT/KW/16/7504**

Time : Three Hours *0885* Max. Marks : 80

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Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

**1.** a) With suitable schematic, explain structure of realistic compiler. **7**

b) Explain the advantages of analysis - synthesis model of compilation. Also give example to illustrate your answer. **6**

**OR**

**2.** a) Construct transition diagram and regular expression for the following - **6**

i) identifier ii) Unsigned number (integer and real number).

b) What are the tools that can aid in the process of compilation ? Explain each tool, briefly. Give flex I/p specifications used to represent Lexical constructs of programming language. **7**

**3.** a) What are the issues of CFG for the programming languages that need to be considered while designing top down parser ? **6**

b) What do you mean by recursive descent parser ? Design recursive descent parser for the following grammer - $S \rightarrow aCa$ , $C \rightarrow c/b$. **5**

c) Compute the first and follow set of A in the following grammar - $A \rightarrow (A)A/\in$. **3**

**OR**

**4.** a) Write an algorithm for construction of parsing table for SLR parser. **6**

b) Construct LALR parsing table for the following grammar with S as a start symbol. **8**

$S \rightarrow AA$

$A \rightarrow aA/b$

**5.** a) Give translation scheme for the following programming language constructs - **6**

i) For loop ii) IF-Then-Else iii) While-do

b) Give SDTS for the following statement and translate the following statement into intermediate code. **8**

$A[I,J] = B[I,J] + C[I+J+K]$ where

A is 2-D array of size $10*10$,

B is 2-D array of size $10*10$,

C is 1-D array of size 30 and BPW = 4

**OR**

6. a) Give translation scheme and generate three address code and parse tree of the following program segment - **8**

```
While (A < C and B < D) do
{
        if A == 1 then C = C + 1
        else
         {
           while A < = D do
                A = A + 3
         }
        }
```

b) Explain the data structures used for representation of three address code and compare them. **6**

7. a) What are the various attributes that should be stored in symbol table. **5**

b) Discuss various data structures used for implementation of symbol table and compare them. **8**

**OR**

8. a) What do you mean by phrase level error recovery ? Explain phrase level error recovery scheme for LL parser with grammar. **9**

$E \rightarrow TE'$

$E' \rightarrow +TE' / \in$

$T \rightarrow FT'$

$T' \rightarrow *FT' / \in$

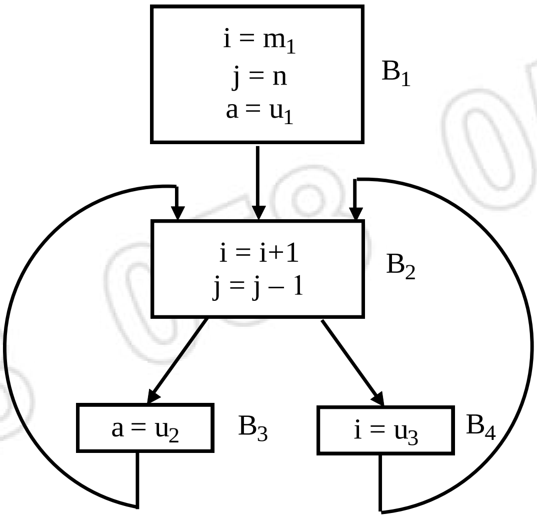
$F \rightarrow id$

Also show the behavior of above parser for the input $w = id + *id\$$.

b) Explain how scope information is represented in symbol table for block structured programming languages. **4**

9. a) Give an algorithm to find out the iterative solution of data flow equations. **5**

b) Consider the flow graph - **8**



Find IN and OUT for the above example.

**OR**

**10** a) Consider the code segment as shown - **8**

```
{
    prod = 0;
    i = 0;
   do{
        prod = prod + a[i] * b[i]
        i = i + 1
      }
   while (i <= 20)
}
```

Explain clearly how DAG can be used for code optimization for above code.

b) Explain in detail the principle sources of optimization. Give proper examples. **5**

**11.** a) What is the role of register descriptor and address descriptor in simple code generation algorithm ? Give steps involved in simple code generation algorithm. **6**

b) Consider the expression - **7**

$a = (p+q) - ((r+s) - t)$

Answer the following-

i) Give its three address code.

ii) Generate code using simple code generation algorithm.

**OR**

**12.** a) Consider the three address code **7**

$t_1 = a + b$

$t_2 = c + d$

$t_3 = e - t_2$

$t_4 = t_1 - t_3$

i) Construct DAG representation for the above code.

ii) Apply labelling algorithm to determine number of registers required to generate a code.

b) What do you mean by peephole optimization ? Explain it in detail. **6**

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