Course Code : CST 412 **MQNR/MW – 19 / 9655**

Seventh Semester B. E. (Computer Science and Engineering) Examination

LANGUAGE PROCESSORS

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry marks as indicated.
(2) Due credit will be given to neatness.
(3) Assume suitable data wherever necessary.
(4) Illustrate your answers wherever necessary with the help of neat sketches.

1. (a) Design the DFA for the following regular expression.

(a | b)|(ab)*b | a*(bb)* 4(CO1)

OR

(b) Design the output of the lexical analysis phase for the given code fragment.

```
int i, j, k[10];
scanf ("Enter the values");
printf ("The values are %d%d", i++ + i--);
k[4]=i*j--
```

Find the total number of tokens present in the code fragment. Also write the tokens in the form <attribute, token> pair. 4(CO1)

(c) What are the various components of lexical specification file ? Write a LEX program that can detect C language comments. Support both the single line comment syntax (//) and multi line comment syntax (/* */). 4(CO1)

(d) State **True** or **False** :

(i) The separation of compiler into front and back end helps in adding support for the new source language easily.

(ii) The lexical analyzer strip out the comments and white spaces from the input source program.

(iii) A lexical analyzer generator cannot be used to generate the lexical analyzer for different programming languages.

(iv) Semantic analyzer checks if all variables are declared before use. 2(CO1)

2. (a) Consider the following grammar :

S –> ABC

A –> A a | d

B –> B b | e

C –> C e | f

(a) Support the necessary changes to make it suitable for LL (1) parsing.

(b) Construct the parsing table and check the grammar is LL (1) or not. 6(CO2)

OR

(b) Design canonical parsing table for the following grammar. Taking suitable example show the parsing of any valid string.

Stat–>LHS=RHS

Stat–>RHS

LHS–>*RHS

LHS–>id

RHS–>LHS 6(CO2)

(c) How does the operator precedence parser works ? Design the operator precedence table and use it to guide the parsing of an input a + b – 20*c. 4(CO2)

3. (a) Describe the back patching technique. How is it used in the translation of input C statement ? Also construct annotated parse tree.

If((a < b) | | (c < d)) {m = 20;} else {m = 10:} p = m; 4(CO3)

(b) Generate TAC using SDTS for the following code :

```
int  A[20[20],  B[10][10],  C[50][30],  D[100]
While  (I  <=20)
{
for  (j = 1;  j < = 50;  j++)
A[I,  J] = B[I,  J] + C[I + 1,  D[j]]
}
```

6(CO3)

4. (a) How phrase level error recovery is done in LR (0) parsing for the grammar E–> E – E | E * E | E + E | id. Analyze by taking the suitable example of valid and invalid string. 7(CO1,CO2)

(b) Describe the activation record in a C run time environment. In which section of memory is the activation record located in C run time environment? 3(CO1)

OR

(c) List out the various attributes for implementing the symbol table. Represent the scope information using different symbol table for the following code.

```
int  a;
void  Proc1(int  c){
    float  x,  y;
    -------
    {
    int  i,  j;
    }
    ------
   {
      int  x;     }
int  Proc2(int  n){
  char  t;
   --------
   }
```

3(CO1)

5. (a) Use appropriate technique of code optimization to optimize the following code :

```
X=1;   Y=2;   Z=0;
While  (X<20)
{
     Avg   =   Z / 1;
     T = Z *2;
     Temp = D + X/4;
     X = X + 10;
}
```

2(CO4)

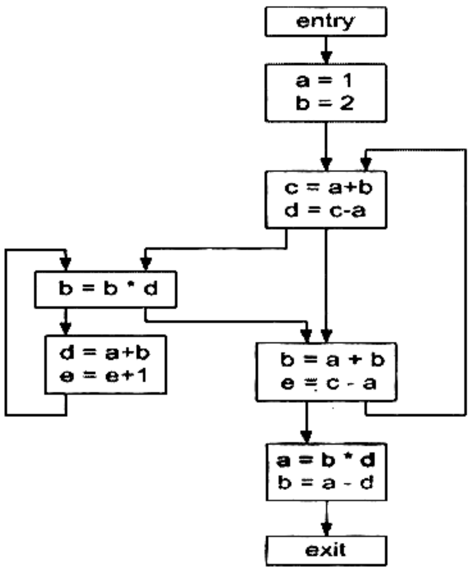
OR

(b) Construct the DAG and identify the common sub expression for the input source program

```
void  func()
{
  a = (b + c) *d
  e = f* a
  f = (b + c)* e
  g = (b + c) / d
}
```

2(CO4)

(c) Consider the program flow graph. Identify the loop and Determine the loop invariant computation and move it to the pre header outside the loop.

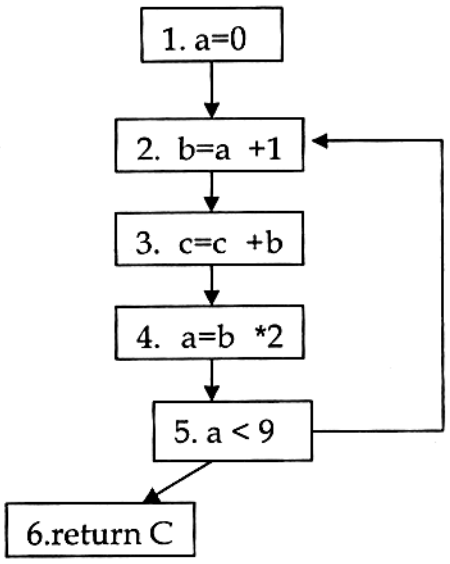


8(CO4)

6. (a) Use the simple code generator to generate target code sequence for the following statement d:=(a–b)+(a–c)+(a–c)

Justify the use of Register descriptor and Address Descriptor. 5(CO4)

(b) Apply the graph coloring method to determine the register allocation in the given control flow graph.



5(CO4)