Course Code : CST 402 **ITSJ/RW – 17 / 1099**

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

LANGUAGE PROCESSORS

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) Each question 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) Discuss and explain the action taken by every phase of compilation including symbol table and memory respresentation for the input a = b*c + d/e. 6(CO 1)

(b) Construct the context free grammar for the language :

(i) L = {W | w belongs to (a, b) * and w starts and ends with the same symbol.

(ii) L = $\{a^n b^{2m} \mid n >= 0, \ m > 0\}$. 4(CO 1)

OR

(c) Design a LEX program to identify word list of ARTICLE, VERB, NOUN, ADJECTIVE, ADVERB, PUNCTUATION, and PREPOSITION from the user and tokenize the input string to identify it. 4(CO 1)

2. (a) Given the grammar S–> a |(L) L–>L, S | S

(i) Do the necessary changes to make it suitable for LL(1) parser.

(ii) Check the resultant grammar is LL(1) or not.

(iii) Show the moves made by the LL(1) parser on the input (a, (a, a)). 6(CO 2)

OR

(b) Consider the following grammar for type declaration :

$S \rightarrow CC$

$C \rightarrow eC \mid d$

Construct the CLR parser and parse the input string "eddded" and using the generated parser. Is the grammar LALR ? 6(CO 2)

(c) Compute LEADING and TRAILING for the following grammar. Also Compute the operator precedence relation and precedence function for this grammar.

S–> | ^ | (T)

T–> T, S | S 4(CO 2)

3. (a) Generate 3 address codes for the following program fragment where a and b are array of size 20 and each element is 4 bytes per word. Also write the SDT for DO–WHILE.

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

6(CO 3)

OR

(b) Generate and three address code for the following program fragment A[i][j] = A[i][j] + B[C[k],1]

Where A and B are array of 10 by 20 and C is an array of 10 elements {Assume lower bound to be 0 for each dimension and bpw = 8 bytes/word} 6(CO 3)

(c) Explain why every S–attributed definition is L–attributed ? Compare the S–attributed definition and L–attributed definition with example. 4(CO 3)

4. (a) Discuss error recovery routine of the LR parser for the following grammar:

E–> E+E | E * E | id

Trace out the behavior of parser generated on the input string b*+c; 5(CO 2)

(b) A C language code to compute Fibonacci numbers recursively is shown below.

```
int f(int n)
{
    int t, s;
    if (n<=2) return 1;
    s = f(n–1)
    t = f(n–2)
    return(s–t)
}
```

(i) Draw activation record for the call f(5).

(ii) What is largest number of activation record's that appear together on the stack ? 5(CO 4)

OR

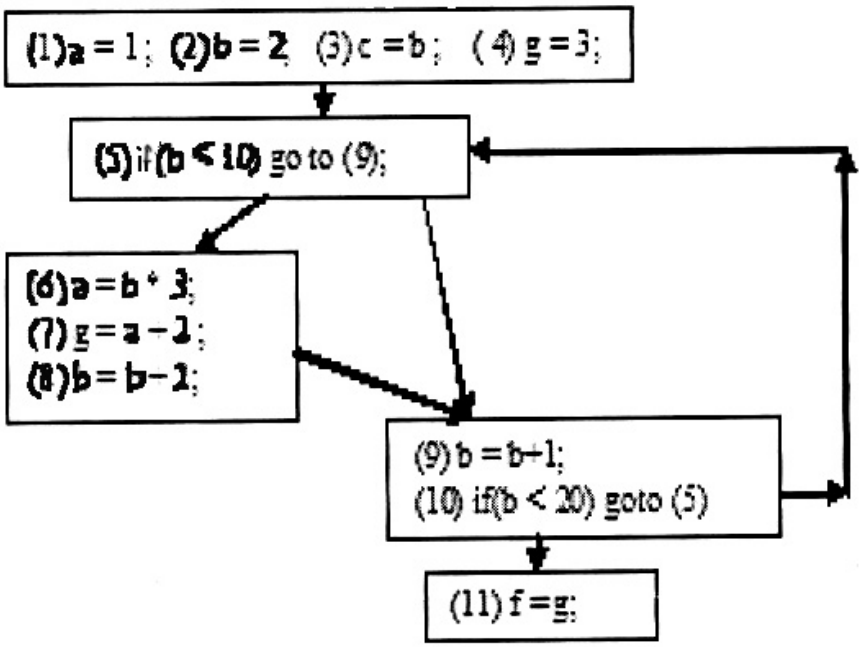
(c) Discuss the various data structure required for organizing the symbol table. 5(CO 4)

5. (a) Generate DAG representation of the program flow graph for the following code

```
i=1
While(i<=10) do
  Sum+ = a[i];
```

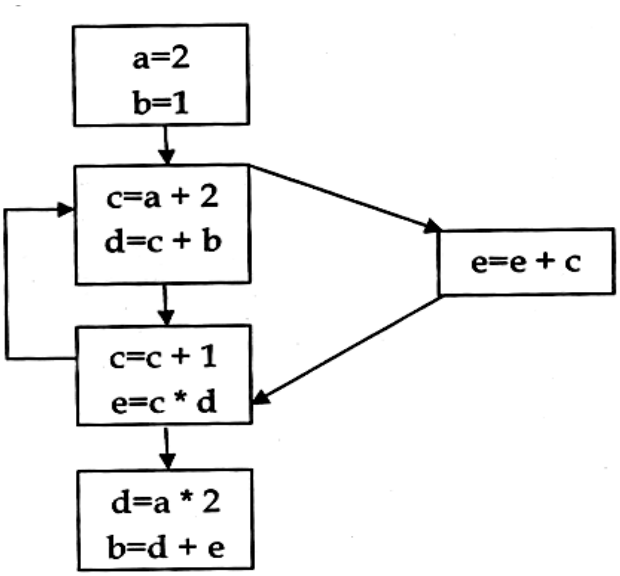
3(CO 4)

(b) Consider the following flow graph, Eliminate Induction variable form the following program:



2(CO 4)

(c) Perform live variable analysis for the given flow graph.



5(CO 4)

6. (a) Generate code for the following basic block using gencode() algorithm

t1 = b + c

t2 = d * e

t3 = t2 * t1

X = t3 * f

Assume that two registers R0 and R1 are available. 5(CO 4)

(b) Discuss Peephole optimization techniques with example. 5(CO 4)