10. Given the following code segment in Fig-2, construct the flow graph. Then, perform copy propagation and induction variable elimination on the code. [4+5+5]

```
(1)  i := m-1                (16)     t7 := 4*i
(2)  j := n                  (17)     t8 := 4*j
(3)  t1 := 4*n               (18)     t9 := a[t8]
(4)  v := a[t1]              (19)  a[t7] := t9
(5)  i := i+1                (20)    t10 := 4*j
(6)  t2 := 4*i               (21)  a[t10] := x
(7)  t3 := a[t2]             (22)     goto (5)
(8)  if t3 < v goto (5)      (23)    t11 := 4*i
(9)  j := j-1                (24)      x := a[t11]
(10) t4 := 4*j               (25)    t12 := 4*i
(11) t5 := a[t4]             (26)    t13 := 4*n
(12) if t5 > v goto (9)      (27)    t14 := a[t13]
(13) if i >= j goto (23)     (28)  a[t12] := t14
(14) t6 := 4*i               (29)    t15 := 4*n
(15) x := a[t6]              (30)  a[t15] := x
```

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B.Tech Even Semester Examination, May, 2025

Computer Science & Engineering

(6th Semester)

Course No: CSE-601

(Compiler Design)

Full Marks: 70

Pass Marks: 28

Time: 3 hours

Note:

1. Attempt any five questions taking one each unit.
2. Begin each answer in a new page
3. Answer parts of a question at a place
4. Assume reasonable data wherever required
5. The figure in the right margin indicates full marks for the question
6. All the mathematical symbols and abbreviations have their usual meanings.

UNIT-I

1. (a) Discuss about different Analysis part of a source program with an example [9]

   (b) Write short notes on (i) symbol table management and (ii) error handler activities of the compiler [5]

2. (a) Discuss the lexical form of specification of the following tokens (i) variables and (ii) Unsigned numbers of the C program [5]

   (b) Write short notes on specification and recognition of tokens [5]

   (c) Define a token and a pattern [4]

Turn Over

UNIT-II

3. Write the algorithm for:(i) Closure (ii) Goto (iii) Item sets of an LR(1) item.Also, show the set of LR(1) items for the given grammar:

   $S \rightarrow CC$

   $C \rightarrow cC \mid d$ [3+2+3+6]

4. (a) Explain the model of **non-recursive predictive parsing** and write its **parsing algorithm** [4+5]

   (b) Write the S**LR parsing algorithm** [5]

UNIT-III

5. (a) What is a syntax-directed definition? Write the syntax-directed definition (SDD) for the following grammar. Also, construct the annotated parse tree for the input string 3 * 5 + 4 using **bottom-up parsing**.

   Given grammar rules:

   i. E→E + T

   ii. E→T

   iii. T→T * F

   iv. T→F

   v. F→(E)

   vi. F→digit [2+5+7]

6. (a) What is an inherited attribute? Show that the following grammar is an inherited-attributed grammar by taking an example and deriving its annotated parse tree.

   D→TL

   T→int

   T→real

   L→L1,id

   L→id. [2+12]

UNIT-IV

7. (a) What is an activation record? Explain its structure and describe how it is used in managing function calls during program execution, providing an example. [2+3+4]

   (b) Describe the different types of memory allocation strategies used in a runtime environment [5]

8. (a) Explain the concept of a runtime environment in compiler design. Why is it important? , [2+1]

   (b) What is intermediate code representation? Explain three different forms of three-address code representations by taking the example

   a = b * –c + b * –c . [2+9]

UNIT-V

9. Write the algorithm for computing IN and OUT sets. Then, compute the GEN and KILL sets for the graph given in Fig-1. Finally, calculate the IN and OUT sets for the graph using the algorithm. [4+4+6]