Full Marks: 70   **Time: 1 hour 30 minutes**

Group A

Answer any one from questions 1 and 2.

1. Consider the following augmented grammar with the set of terminal symbols {a,b,c,d,e, #} and the set of non-terminal symbols {S,A,B,C}   when S is the start symbol of the grammar. The production rules of the augmented grammar are:

    S→A#
    A→bB
    B→cC
    B→cCe
    C→dA
    A→a

   (i)   Construct the collection of sets of LR(0) items for this grammar and draw LR(0) parsing machine.   9
   (ii) Compute FIRST and FOLLOW for all nonterminal symbols.   2+6
   (iii) Draw the parsing table.   10
   (iv) Is the grammar SLR? Show the reason for your answer.   1+2

2. (a) Define left-recursive grammar. How can left-recursion be removed from a left-recursive grammar.   2+4

(b) Consider the grammar with the set of terminal symbols {a,i,e,t,b,#} and the set of nonterminal symbols {S, S', E} when S is the start symbol of the grammar and # is the terminal symbol appended to the input string to be parsed:

    S→iEtSS' |a
    S'→eS|Ɛ
    E→b

   (i)   Define FIRST and FOLLOW of a non-terminal symbol.   4
   (ii)   Compute FIRST and FOLLOW of all non-terminal symbols.   2+4
   (iii)   Compute and show the predictive parsing table.   8
   (iv)   Define LL(1) grammar. Is the grammar defined above LL(1)? 4+2

Group B

Answer any two questions from question numbers 3, 4, and 5

3. (a) Discuss the necessity of using MACRO in Assembly language programming. What are the data structures needed to design a MACRO preprocessor. Explain the MACRO preprocessor using a flowchart.   2+4+4

   (b) What is the issue that motivates to design a 2-pass assembler? How can this issue be resolved if single pass assembler is designed?   2+4

   (c) What are the relative advantages and disadvantages of single pass and two pass assemblers?   4

4. (a) Define synthesized attribute and inherited attribute. Using suitable example grammar, explain Synthesized attribute and Inherited attribute for the symbols in a grammar.   5+5

   (b) Define activation record. What are the components of an activation record? How is the display area constructed, if a block at level j is entered from a block at level i?   2+4+4

5. (a) Define the data flow properties: (i) Available expression (ii) Reaching definition. What are the conditions that need to be satisfied for (i) an expression to be available and (ii) a definition to reach at a particular point of the source program. (2+2)+(3+3)

   (b) How can directed acyclic graph (DAG) be used to eliminate common sub-expression? Explain with example.   10