Each problem is awarded a maximum of 25 points. Justify your answers!

1. Determine the number of different binary search trees with exactly 6 nodes, which contain values 27, 1, 3452, 815, 29, and 100.

2. Transform the following logical formula into disjunctive normal form:
   \[ \sim((y \land \sim(z \land u)) \lor (z \land (y \lor \sim(x)))) \]
   The symbols x, y, z, u denote logical variables, the symbol \( \land \) stands for conjunction, \( \lor \) denotes disjunction, and \( \sim x \) denotes negation of the variable x.
   a) Find any solution.
   b) Find a solution in the form of a disjunction with at most two clauses.

3. Design a deterministic finite automaton over the alphabet \{0, 1\} that accepts exactly words having two identical initial letters and two identical trailing letters (the initial letters and the trailing letters may be different). For example, it accepts the words 00, 11, 00100, 11010010000, but it rejects the words 1, 0101, 110110. Write the transition function of the automaton as a table and draw the automaton in the form of a transition diagram. Try to design the simplest possible automaton, that is, one with the smallest number of states.

4. The following program is given (the Pascal form and the C form are equivalent):

   ```pascal
   program A;
   var P: array[0..200] of integer;
   i: integer;
   begin
     for i:=0 to 200 do P[i] := i;
     for i:=1 to 200 do P[i] := P[i] + P[i-1];
     for i:=1 to 200 do write(P[i], ' ');
   end.

   main() /* A */
   {
     int p[201];
     int i;
     for(i = 0; i <= 200; i++) p[i] = i;
     for(i = 1; i <= 200; i++) p[i] = p[i] + p[i-1];
     for(i = 1; i <= 200; i++) printf("%d ", p[i]);
   }
   ```
   a) Determine the index in the array P, where the value 200 will be after the computation.
   b) Determine the index in the array P, where the value 5050 will be after the computation.
   c) Determine the index in the array P, where the value 22155 will be after the computation.
   Find all the solutions and give reasons why no other solution exists.