





4.	<p>b)</p> <p>Consider the following control-flow graph where the set of live variables at each point of the program are provided for you. Variable a is live upon entry and g is live upon exit. Listed from simplest to most complex, program statements can take one of the following forms: <math>x = 1</math>, <math>x = y</math> and <math>x = y + z</math>, where x, y, z are variables. Variables can be used more than once in a statement. Do not assign to dead variables.</p> <p>Provide code in each of the boxes that is consistent with the computed set of live variables at every point of the program. When several program statements may work, pick the simplest among them.</p>	5
4.	<p>c)</p> <p>In a short paragraph, provide an intuitive explanation of how to rewrite a program into minimal SSA form. In particular, describe the motivation for <math>\Phi</math>-node placement. Why are they placed where they are?</p> <p>We would like an answer that shows you understand the concepts, and not just a list of steps repeated from the lecture notes. Use examples when useful to illustrate your points.</p>	3
4.	<p>d)</p> <p>Provide Three-address code and its Quadruple, Triple and Indirect Triple representation.</p> <p><math>a = b[i] + c[j]</math></p>	7
5.	<p>a)</p> <p>What is an activation? [1 mark]</p> <p>b)</p> <p>What is an activation record? [1 mark]</p> <p>c)</p> <p>Briefly explain the Activation record structure. [5 mark]</p> <p>d)</p> <p>Given the following method in a ML-like language, What is the activation record of this method? List all values, their location. [3 mark]</p> <p>exp(base: Int, exponent: Int) : Int {            int result = 1;            while (0 &lt; exponent loop) {              result = result * base;              exponent = exponent - 1;            }            return result;        }</p>	10

5.	<p>b)</p> <p>Apply a Simple Code generation algorithm For the given code sequence. Consider t,u,v as temporaries and a,b,c,d as variables where only d is live on exit from the block. Provide the register descriptor and address descriptor information clearly. Assume you have 3 registers available R0, R1 and R2 and you are suggested to use them optimally.</p> <p> <math>t = a - b</math>  <math>u = a - c</math>  <math>v = t + u</math>  <math>d = v + u</math> </p>	7
5.	<p>c)</p> <p>Given the activation tree, answer the following :</p> <p>(a) Which activations are live at the node QS(1,4)?</p> <p>(b) Specify the order in which the functions are called?</p> <p>(c) Specify the order in which the functions return?</p>	<div> <pre> graph TD     main --&gt; readarray     readarray --&gt; P1n["Partition(1, n)"]     P1n --&gt; QS14["Quicksort(1, 4)"]     QS14 --&gt; P12["Partition(1, 2)"]     P12 --&gt; QS44["Quicksort(4, 4)"]     QS44 --&gt; QS64["Quicksort(6, 4)"]     QS64 --&gt; dots1["..."]     P12 -- "Partition returns 3rd element" --&gt; QS14     P1n -- "Partition returns 3rd element" --&gt; QS14     </pre> </div>