1. (3 points) Given a compiler that performs short-circuit code, and three variables \( x, y, \) and \( z, \) with initial values \( x = 10, y = 20, \) and \( z = 100, \) please give the final values of the variables after the following statement:

\[
\text{if}(x > 0 \land (y = 5 \land z = 0)) \quad x = 2; \quad y = 20; \quad z = 100
\]

2. (3 points) Identify whether the grammar symbol attributes in the following grammar are synthesized or inherited.

<table>
<thead>
<tr>
<th>Grammar</th>
<th>Semantic Action</th>
<th>Attribute</th>
<th>Synthesized/Inherited?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decl ( \rightarrow ) Type VList</td>
<td>VList.type = Type.type</td>
<td>VList.type</td>
<td>Inherited</td>
</tr>
<tr>
<td>Type ( \rightarrow ) int</td>
<td>Type.type = int.type</td>
<td>Type.type</td>
<td>Synthesized</td>
</tr>
<tr>
<td>VList ( \rightarrow ) id</td>
<td>id.type = VList.type</td>
<td>id.type</td>
<td>Inherited</td>
</tr>
</tbody>
</table>

3. (4 points) Given the below SDD, show how you will traverse the parse tree and apply the semantic rules to translate the expression \( a + b * c \) (represented by the parse tree) into three-address code.

```
E \( \rightarrow \) E1 + E2
E \( \rightarrow \) E1 * E2
E \( \rightarrow \) id
E.code = new Temp()
E.addr = id.lexeme
E.code = ""
E1.code = E1.code \( || \) E2.code \( \mid \) gen(E.addr = \( \text{Expr} \), E1.addr = \( \text{Expr} \), E2.addr = \( \text{Expr} \))
```

Following actions are performed in the order the nodes are reached during the parse tree traversal.

**Node 1:**

\[ E1.addr = a \]
\[ E1.code = "" \]

**Node 2:**

\[ E3.addr = b \]
\[ E3.code = "" \]

**Node 3:**

\[ E4.addr = c \]
\[ E4.code = "" \]

**Node 4:**

\[ E2.addr = t1 \]
\[ E2.code: \quad t1 = b \ast c \]

**Node 5:**

\[ E.addr = t2 \]
\[ E.code = "" \]

\[ t2 = a + t1 \]