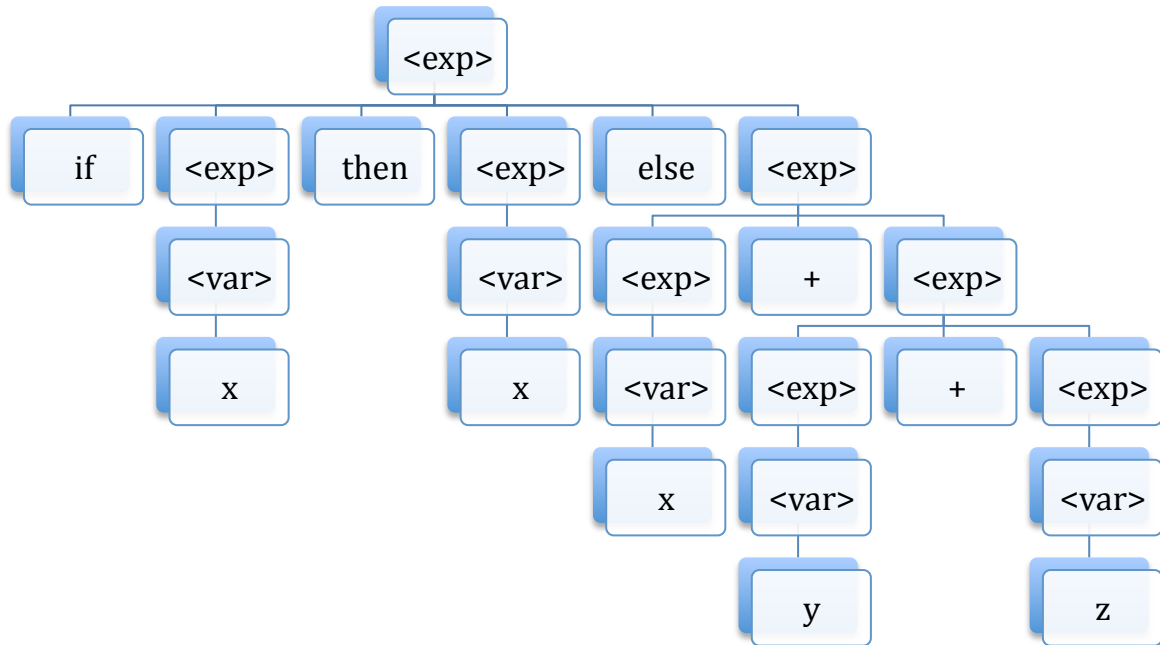


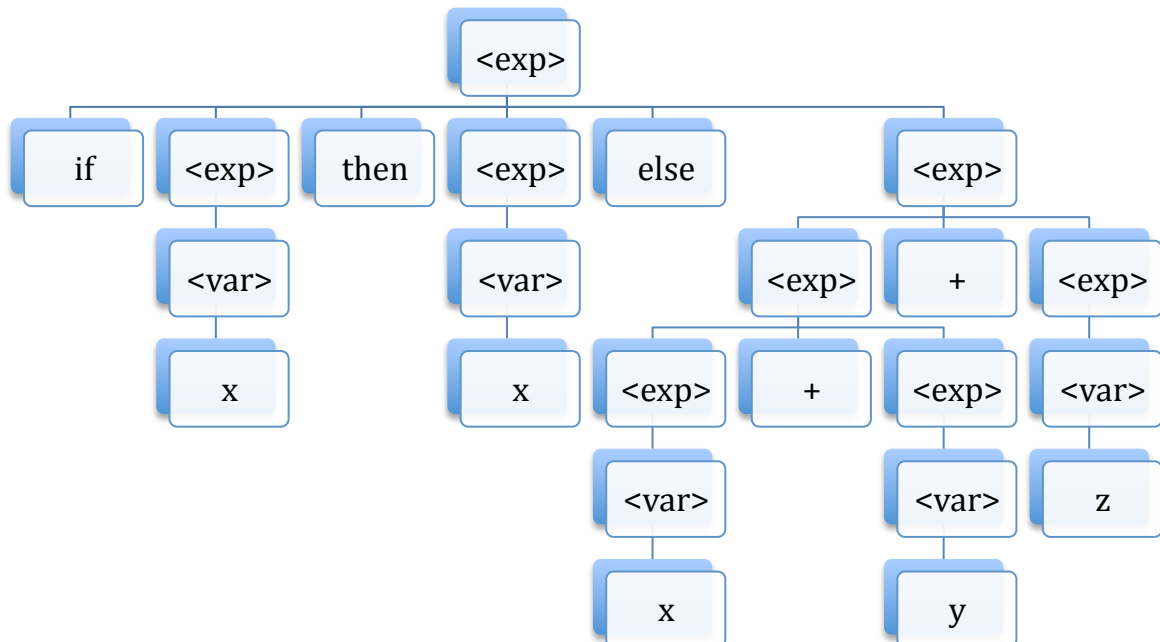
a) If x then x else x+y+z

3 Ambiguous Parse Trees

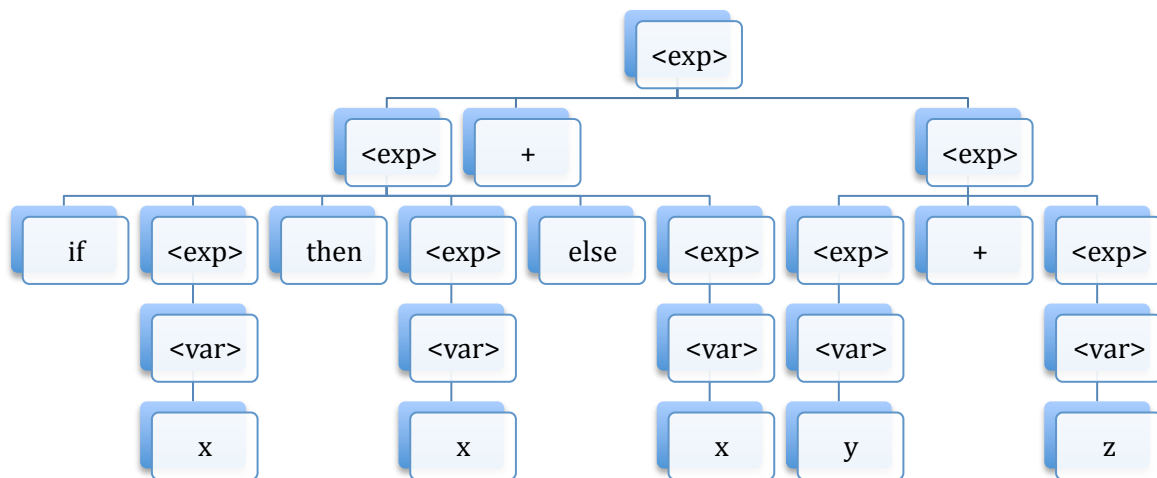
i)



ii)



iii)



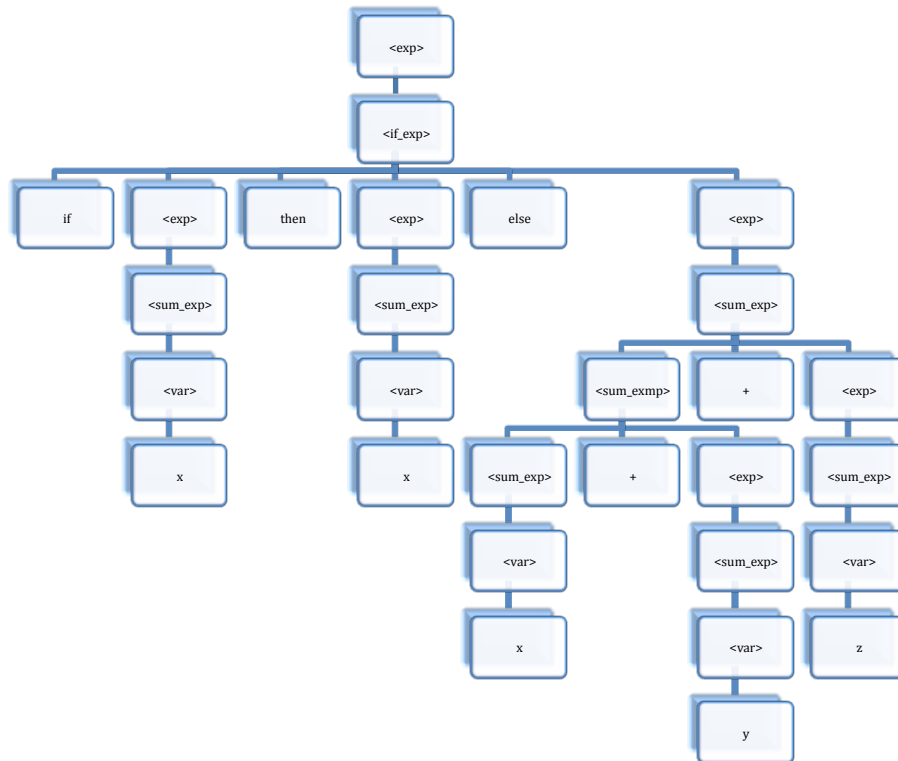
b)

Unambiguous Grammar:

$\langle \text{exp} \rangle ::= \langle \text{sum_exp} \rangle \mid \langle \text{if_exp} \rangle$
 $\langle \text{sum_exp} \rangle ::= \langle \text{var} \rangle \mid \langle \text{sum_exp} \rangle + \langle \text{exp} \rangle$
 $\langle \text{if_exp} \rangle ::= \text{if } \langle \text{exp} \rangle \text{ then } \langle \text{exp} \rangle \text{ else } \langle \text{exp} \rangle$
 $\langle \text{var} \rangle ::= x \mid y \mid z$

c)

if x then x else x + y + z



2.

Stack	Current String	Action
Empty	lzpor[EOF]	Initialize Stack go to state 1
st1	lzpor[EOF]	Push l and st5 on stack
St5, l, st1	zpor[EOF]	Push z and st3 on stack
St3, z, st5, l, st1	por[EOF]	Reduce by rule 3 pop 2 off stack
St5, l, st1	por[EOF]	Push <t> and st7 on stack
St7, <t>, st5, l, st1	por[EOF]	Push p and st9 on stack
St9, p, st7, <t>, st5, l, st1	or[EOF]	Push o and st4 on stack
St4, o, st9, p, st7, <t>, st5, l, st1	r[EOF]	Reduce by rule 4 pop 2 off stack
St9, p, st7, <t>, st5, l, st1	r[EOF]	Push <t> and st7 on stack
St7, <t>, st9, p, st7, <t>, ...	r[EOF]	Reduce by rule 1 pop 2 off stack
St9, p, st7, <t>, st5, l, st1	r[EOF]	Push <e> and st11 on stack
St11, <e>, st9, p, st7, <t>, ...	r[EOF]	Reduce by rule 2 pop 6 off stack
St5, l, st1	r[EOF]	Push <e> and st8 on stack
St8, <e>, st5, l, st1	r[EOF]	Push r and st10 on stack
St10, r, st8, <e>, st5, l, st1	[EOF]	Reduce by rule 5 pop 6 off stack
st1	[EOF]	Push <t> and st7 on stack
St7, <t>, st1	[EOF]	Reduce by rule 1 pop 2 off stack
st1	[EOF]	Push <e> and st2 on stack
St2, <e>, st1	[EOF]	Accept!