

CONTEXT FREE GRAMMAR

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1. The BNF Notation (Backus-Naur Form) with Optional Elements

- A Grammar for if-then-else can be replaced by:
 - $S \rightarrow \text{iCtSA}$
 - $A \rightarrow ;eS \mid \epsilon$

Now we apply derivations of the previous two rules.

- $S \rightarrow \text{iCtSA} \rightarrow$
- $\text{iCtSeS} \rightarrow \text{iCt}(\text{iCtSA})e(\text{iCtSA}) \rightarrow$
- $\text{iCt}(\text{iCtSeS})e(\text{iCtSeS}) \rightarrow \text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})] \rightarrow$
- $\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})] \rightarrow \text{iCt}[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})]e[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})] \rightarrow$
- $\text{iCt}[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})]e[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})] \rightarrow$
 $\text{iCt}\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\}e\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\} \rightarrow$
- $\text{iCt}\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\}e\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\} \rightarrow$
 $\text{iCt}\{\text{iCt}[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})]e[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})]\}e\{\text{iCt}[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})]e[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})]\} \rightarrow$
- $\text{iCt}\{\text{iCt}[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})]e[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})]\}e\{\text{iCt}[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})]e[\text{iCt}(\text{iCtSeS})e(\text{iCtSeS})]\} \rightarrow$
 $\text{iCt}\{\text{iCt}\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\}e\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\}\}e\{\text{iCt}\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\}e\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\}\} \rightarrow$
- $\text{iCt}\{\text{iCt}\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\}e\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\}\}e\{\text{iCt}\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\}e\{\text{iCt}[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]e[\text{iCt}(\text{iCtSA})e(\text{iCtSA})]\}\} \rightarrow$
 $\text{iCt}\{\text{iCt}\{\text{iCt}[\text{iCt}(\text{iCtS})e(\text{iCtS})]e[\text{iCt}(\text{iCtS})e(\text{iCtS})]\}e\{\text{iCt}[\text{iCt}(\text{iCtS})e(\text{iCtS})]e[\text{iCt}(\text{iCtS})e(\text{iCtS})]\}\}e\{\text{iCt}\{\text{iCt}[\text{iCt}(\text{iCtS})e(\text{iCtS})]e[\text{iCt}(\text{iCtS})e(\text{iCtS})]\}e\{\text{iCt}[\text{iCt}(\text{iCtS})e(\text{iCtS})]e[\text{iCt}(\text{iCtS})e(\text{iCtS})]\}\}e\{\text{iCt}[\text{iCt}(\text{iCtS})e(\text{iCtS})]e[\text{iCt}(\text{iCtS})e(\text{iCtS})]\}\}.$

2. Pseudocode

```
if(condition) then
{
    if(condition) then
    {
        if(condition) then
        {
            if(condition) then
            {
                S
            }
        }
        else
        {
            if(condition) then
            {
                S
            }
        }
    }
    else
    {
        if(condition) then
        {
            if(condition) then
            {
                S
            }
        }
        else
        {
            if(condition) then
            {
                S
            }
        }
    }
}
else
{
    if(condition) then
    {
        if(condition) then
        {
            if(condition) then
            {
                S
            }
        }
        else
        {
            if(condition) then
            {
                S
            }
        }
    }
}
```

```

}
else
{
    if(condition) then
    {
        if(condition) then
        {
            S
        }
    }
    else
    {
        if(condition) then
        {
            S
        }
    }
}
}
else
{
    if(condition) then
    {
        if(condition) then
        {
            if(condition) then
            {
                S
            }
        }
        else
        {
            if(condition) then
            {
                S
            }
        }
    }
    else
    {
        if(condition) then
        {
            if(condition) then
            {
                S
            }
        }
        else
        {
            if(condition) then
            {
                S
            }
        }
    }
}

```

```

    }
    }
}
else
{
    if(condition) then
    {
        if(condition) then
        {
            if(condition) then
            {
                S
            }
        }
        else
        {
            if(condition) then
            {
                S
            }
        }
    }
    else
    {
        if(condition) then
        {
            if(condition) then
            {
                S
            }
        }
        else
        {
            if(condition) then
            {
                S
            }
        }
    }
}
}
}

```