Problem description:
Every employee receives vacation days according to the following rules:

1. Every employee receives at least 22 vacation days.
2. Employees younger than 18 or at least 60 years, or employees with at least 30 years of service can receive extra 5 days.
3. Employees with at least 30 years of service and also employees of age 60 or more, can receive extra 3 days, on top of possible additional days already given.
4. If an employee has at least 15 but less than 30 years of service, extra 2 days can be given. These 2 days can also be provided for employees of age 45 or more.
5. A college student is eligible to 1 extra vacation day.
6. If an employee is a veteran, 2 extra days can be given.
7. The total number of vacation days cannot exceed 29.

In my opinion it is not a problem to rewrite rules 2 and 3:

1. Every employee receives at least 22 vacation days.
2. Employees younger than 18 receive extra 5 days.
3. Employees with at least 30 years of service and also employees of age 60 or more, can receive extra 8 days.
Implementation of the decision tables in DT5GL:

Table 0: Vacation days
If:
Subtotal <= 28 | 0| 1| 2|
Total <= 29   | Y| Y| N|
Then:
Vacation_days is Not_restricted | X| | |
Vacation_days is Restricted_to_maximum | X| X|
# .......

Attribute: Subtotal
Summation_of: Initial_days + Extra_days

Table 1: Initial days
If: 'initial statement' | 0|
Then:
Initial_days = 22 | X|
# .......

Proposition: 'initial statement'
Askable_using: "xxxxx"

Table 2: Extra days
If:
| 0| 1| 2| 3| 4| 5| 6|
age < 18 | Y| N| N| N| N| N| N|
age < 45 | -| Y| Y| N| N| N| N|
age < 60 | -| -| -| -| Y| Y| N|
service < 15 | -| -| Y| N| N| -| -|
service < 30 | -| -| -| Y| N| Y| N|
Then:
Extra_days = 0 | X| | | | | |
Extra_days = 2 | X| | X| | X| |
Extra_days = 5 | X| | X| | X| X|
Extra_days = 8 | X| | X| | X| X|
# .......

Attribute: age
Askable_using: "What is the years of age of the employee?"
Attribute: service
Askable_using: "What is the years of service of the employee?"

Attribute: Total
Summation_of: Subtotal + Extra_for_student + Extra_for_veteran

Table 3: Extra for student
If:
| 0| 1| 2|
age <= 30 | Y| Y| N|
'employee is college student' | Y| N| -|
Then:
Extra_for_student = 0 | X| X|
Extra_for_student = 1 | X| | |
# .......
# NB The assumption here is that a college student is not older than 30.

Proposition: 'employee is college student'
Askable_using: "***?"
Table 4: Extra for veteran

If:

| age >= 45 | 0 | 1 | 2 |
| 'employee is veteran' | Y | Y | N |

Then:

| Extra_for_veteran = 0 | | X | X |
| Extra_for_veteran = 2 | X | | |

# NB The assumption here is that a veteran is not younger than 45.

Proposition: 'employee is veteran'
Askable_using: "**?"

GoalAttribute: Vacation_days
Case: Not_restricted
Print: "Number of vacation days is: %s." Total
Print: "---------------------------------------------"
Print: "Initial days: %s and Extra days: %s." Initial_days Extra_days
Print: "Extra days for a college student: %s." Extra_for_student
Print: "Extra days for a veteran: %s." Extra_for_veteran
Print: "GoalAttribute Vacation_days: %s." Vacation_days
Print: "---------------------------------------------"

Case: Restricted_to_maximum
Print: "Number of vacation days is restricted to the maximum: 29"
Print: "Sum of Initial days: %s and Extra days: %s gives: %s." Initial_days Extra_days Subtotal
Print: "Extra days for a college student: %s." Extra_for_student
Print: "Extra days for a veteran: %s." Extra_for_veteran
Print: "GoalAttribute Vacation_days: %s." Vacation_days
Print: "---------------------------------------------"
Various test runs

1. Age=17, College student ➔ 22+5+1=28 days

"What is the years of age of the employee?"
> 17
'employee is college student' (y/n)? "y"
Number of vacation days is: 28.
Initial days: 22 and Extra days: 5.
Extra days for a college student: 1.
Extra days for a veteran: 0.
GoalAttribute Vacation_days: Not_restricted.

NB Years of service is not relevant in this and the next case so don’t ask for it!

2. Age=17, Not a College student ➔ 22+5+0=27 days

"What is the years of age of the employee?"
> 17
'employee is college student' (y/n)? "n"
Number of vacation days is: 27.
Initial days: 22 and Extra days: 5.
Extra days for a college student: 0.
Extra days for a veteran: 0.
GoalAttribute Vacation_days: Not_restricted.

3. Age=18, Years of Service=2, College student ➔ 22+0+1=23 days

"What is the years of age of the employee?"
> 18
"What is the years of service of the employee?"
> 2
'employee is college student' (y/n)? "y"
Number of vacation days is: 23.
Initial days: 22 and Extra days: 0.
Extra days for a college student: 1.
Extra days for a veteran: 0.
GoalAttribute Vacation_days: Not_restricted.

4. Age=30, Years of Service=14, Not a College student ➔ 22+0+0=22 days

"What is the years of age of the employee?"
> 30
"What is the years of service of the employee?"
> 14
'employee is college student' (y/n)? "n"
Number of vacation days is: 22.
Initial days: 22 and Extra days: 0.
Extra days for a college student: 0.
Extra days for a veteran: 0.
GoalAttribute Vacation_days: Not_restricted.
5. Age=44, Years of Service=14 ➔ 22+0=22 days

"What is the years of age of the employee?" 
> 44
"What is the years of service of the employee?" 
> 14

Number of vacation days is: 22.

Initial days: 22 and Extra days: 0.
Extra days for a college student: 0.
Extra days for a veteran: 0.
GoalAttribute Vacation_days: Not_restricted.

NB: don’t ask if the employee is a college student or a veteran because of the assumption that a college student is not older than 30 and a veteran is older than 44; the first condition in table 3 and 4.

6. Age=44, Years of Service=29 ➔ 22+2=24 days

"What is the years of age of the employee?" 
> 44
"What is the years of service of the employee?" 
> 29

Number of vacation days is: 24.

Initial days: 22 and Extra days: 2.
Extra days for a college student: 0.
Extra days for a veteran: 0.
GoalAttribute Vacation_days: Not_restricted.

7. Age=44, Years of Service=30 ➔ 22+8=30 days

"What is the years of age of the employee?" 
> 44
"What is the years of service of the employee?" 
> 30

Number of vacation days is restricted to the maximum: 29

Sum of Initial days: 22 and Extra days: 8 gives: 30.
Extra days for a college student: None.
Extra days for a veteran: None.
GoalAttribute Vacation_days: Restricted_to_maximum.

NB: in this case it is pointless to consider if the employee is a college student or a veteran because the maximum has already been exceeded!
8. Age=45, Years of Service=20, Veteran ➔ 22+2+2=26 days

"What is the years of age of the employee?" > 45
"What is the years of service of the employee?" > 20
'employee is veteran' (y/n)? ➔ y
---------------------------------------------
Number of vacation days is: 26.
---------------------------------------------
Initial days: 22 and Extra days: 2.
Extra days for a college student: 0.
Extra days for a veteran: 2.
GoalAttribute Vacation_days: Not_restricted.

9. Age=45, Years of Service=29, Not a Veteran ➔ 22+2+0=24 days

"What is the years of age of the employee?" > 45
"What is the years of service of the employee?" > 29
'employee is veteran' (y/n)? ➔ n
---------------------------------------------
Number of vacation days is: 24.
---------------------------------------------
Initial days: 22 and Extra days: 2.
Extra days for a college student: 0.
Extra days for a veteran: 0.
GoalAttribute Vacation_days: Not_restricted.

10. Age=45, Years of Service=30 ➔ 22+8=30 days

"What is the years of age of the employee?" > 45
"What is the years of service of the employee?" > 30
Number of vacation days is restricted to the maximum: 29
---------------------------------------------
Sum of Initial days: 22 and Extra days: 8 gives: 30.
Extra days for a college student: None.
Extra days for a veteran: None.
GoalAttribute Vacation_days: Restricted_to_maximum.

NB: in this case (and the next one) it is pointless to consider if the employee is a veteran because the maximum has already been exceeded!

11. Age=60 ➔ 22+8=30 days

"What is the years of age of the employee?" > 60
Number of vacation days is restricted to the maximum: 29
---------------------------------------------
Sum of Initial days: 22 and Extra days: 8 gives: 30.
Extra days for a college student: None.
Extra days for a veteran: None.
GoalAttribute Vacation_days: Restricted_to_maximum.
Demo Goal-driven/Backward-chaining reasoning with condition subtables.

8. Age=45, Years of Service=20, Veteran ➔ 22+2+2=26 days

Prove (Vacation_days is Not_restricted)
>> Conditions Table 0 Rule 0:
  Prove (Subtotal <= 28)
    >> Conditions Table 1 Rule 0:
      >> Succeed...
        Derived value for Initial_days is: 22
      >> Conditions Table 2 Rule 1:
        "What is the years of age of the employee?"
        > 45

    >> Failed...
    >> Conditions Table 2 Rule 2:
      >> Failed...
    >> Conditions Table 2 Rule 4:
      "What is the years of service of the employee?"
      > 20

    >> Succeed...
      Derived value for Extra_days is: 2
      Derived value for Subtotal is: 24
    Succeed
  Prove (Total <= 29)
    Derived value for Subtotal is: 24
    >> Conditions Table 3 Rule 1:
      >> Failed...
    >> Conditions Table 3 Rule 2:
      >> Succeed...
        Derived value for Extra_for_student is: 0
    >> Conditions Table 4 Rule 1:
      "employee is veteran' (y/n)? *" y
      >> Failed...
    >> Conditions Table 4 Rule 2:
      >> Failed...
    >> Conditions Table 4 Rule 0:
      >> Succeed...
        Derived value for Extra_for_veteran is: 2
    Derived value for Total is: 26
  Succeed
>> Succeed...
---------------------------------------------
Number of vacation days is: 26.
---------------------------------------------
Initial days: 22 and Extra days: 2.
Extra days for a college student: 0.
Extra days for a veteran: 2.
GoalAttribute Vacation_days: Not_restricted.
---------------------------------------------
Succeed
Another solution with DT5GL; not recommended.

But a nice exercise in making bigger, complete decision tables...

<table>
<thead>
<tr>
<th>Table 0: Vacation days</th>
</tr>
</thead>
<tbody>
<tr>
<td>If:</td>
</tr>
<tr>
<td>age &lt; 18</td>
</tr>
<tr>
<td>age &lt; 45</td>
</tr>
<tr>
<td>age &lt; 60</td>
</tr>
<tr>
<td>service &lt; 15</td>
</tr>
<tr>
<td>service &lt; 30</td>
</tr>
<tr>
<td>'student'</td>
</tr>
<tr>
<td>'veteran'</td>
</tr>
<tr>
<td>Then:</td>
</tr>
<tr>
<td>vacation_days is 22</td>
</tr>
<tr>
<td>vacation_days is 23</td>
</tr>
<tr>
<td>vacation_days is 24</td>
</tr>
<tr>
<td>vacation_days is 26</td>
</tr>
<tr>
<td>vacation_days is 27</td>
</tr>
<tr>
<td>vacation_days is 28</td>
</tr>
<tr>
<td>vacation_days is 30</td>
</tr>
<tr>
<td>'restricted to the maximum'</td>
</tr>
</tbody>
</table>

# .......

Attribute: age
Askable_using: "What is the years of age of the employee?"

Attribute: service
Askable_using: "What is the years of service of the employee?"

Proposition: 'student'
Askable_using: "employee is a college student?"

Proposition: 'veteran'
Askable_using: "employee is a veteran?"

GoalAttribute: vacation_days
Case: 22
Print: "Number of vacation days is: 22."
Case: 23
Print: "Number of vacation days is: 23."
Case: 24
Print: "Number of vacation days is: 24."
Case: 26
Print: "Number of vacation days is: 26."
Case: 27
Print: "Number of vacation days is: 27."
Case: 28
Print: "Number of vacation days is: 28."
Case: 30
Print: "Number of vacation days is: 30."

GoalProposition: 'restricted to the maximum'
Print: "But restricted to the maximum: 29."

8. Age=45, Years of Service=20, Veteran ➔ 22+2+2=26 days
"What is the years of age of the employee?"
> 45
"What is the years of service of the employee?"
> 20
"employee is a veteran? (y/n)? > y
Number of vacation days is: 26.

11. Age=60 ➔ 22+8=30 days
"What is the years of age of the employee?"
> 60
Number of vacation days is: 30.
But restricted to the maximum: 29.