MODULE 6

PROCESS SPECIFICATION

Learning Units

6.1 Structured English specification
6.2 Decision table based specifications
6.3 Detecting
- -Incompleteness
- -Ambiguity
- -Contradictions
- -Redundancy

in decision table specification
6.4 Eliminating redundancy in specifications
6.5 Decision trees for specifications

LEARNING GOALS

In this module we will learn

1. How to use structured English to precisely specify processes
2. The terminology used in structured English
3. Terminology of decision tables and how it is used to specify complex logic
4. How to detect errors in decision table specifications
5. Terminology and use of decision trees
6. Comparison of structured English, decision tables and decision trees

MOTIVATION

- Before designing a system an analyst must clearly understand the logic to be followed by each process block in a DFD

- An analyst's understanding must be cross checked with the user of the information system.

- A notation is thus needed to specify process block in detail which can be understood by a user.

MOTIVATION

- Notation used must be appropriate for the type of the application to be modelled.

- Different notations are needed to represent repetition structures,complex decision situation and situations where sequencing of testing of conditions is important

MOTIVATION

- For complex logical procedures a notation is needed which can also be used to detect logical errors in the specifications.

- A tabular structure for representing logic can be used as a communication tool and can be automatically converted to a program.

PROCESS SPECIFICATION

- Once a DFD is obtained the next step is to precisely specify the process.
- Structured English, Decision tables and Decision Trees are used to describe process.
- Decision tables are used when the process is logically complex involving large number of conditions and alternate solutions
- Decision Trees are used when conditions to be tested must follow a strict time sequence.

STRUCTURED ENGLISH

- Structured English is similar to a programming language such as Pascal
- It does not have strict syntax rules as programming language
- Intention is to give precise description of a process
- The structured English description should be understandable to the user

STRUCTURED ENGLISH

```
if customer pays advance
    then
        Give 5% Discount
    else
        if purchase amount >=10,000
        then
            if the customer is a regular customer
             then  Give 5% Discount
              else  No Discount
            end if
        else   No Discount
        end if
end if
```

DECISION TABLE-EXAMPLE

- **Same structured English procedure given as decision table**

CONDITIONS	RULE1	RULE2	RULE3	RULE4
Advance payment made	Y	N	N	N
Purchase amt >=10,000	-	Y	Y	N
Regular Customer?	-	Y	N	-
ACTIONS				
Give 5% Discount	X	X	-	-
Give No Discount	-	-	X	X

DECISION TABLE-EXPLANATION

- Conditions are questions to be asked
- 'Y' is yes,'N' is no & '-' is irrelevant
- A 'X' against the action says the action must be taken
- A '-' against the action says the action need not be taken

Rule 2 in decision table DISCOUNT states:

if no advance payment and purchase amount >=10000 and regular customer then give 5% discount

STRUCTURED ENGLISH

- Imperative sentences- Actions to be performed should be precise and quantified

Good Example: Give discount of 20%

Bad Example: Give substantial discount

- Operators -Arithmetic : +, -, /, *

Relational : >, >=, <, <=, =, !=

Logical : and, or, not

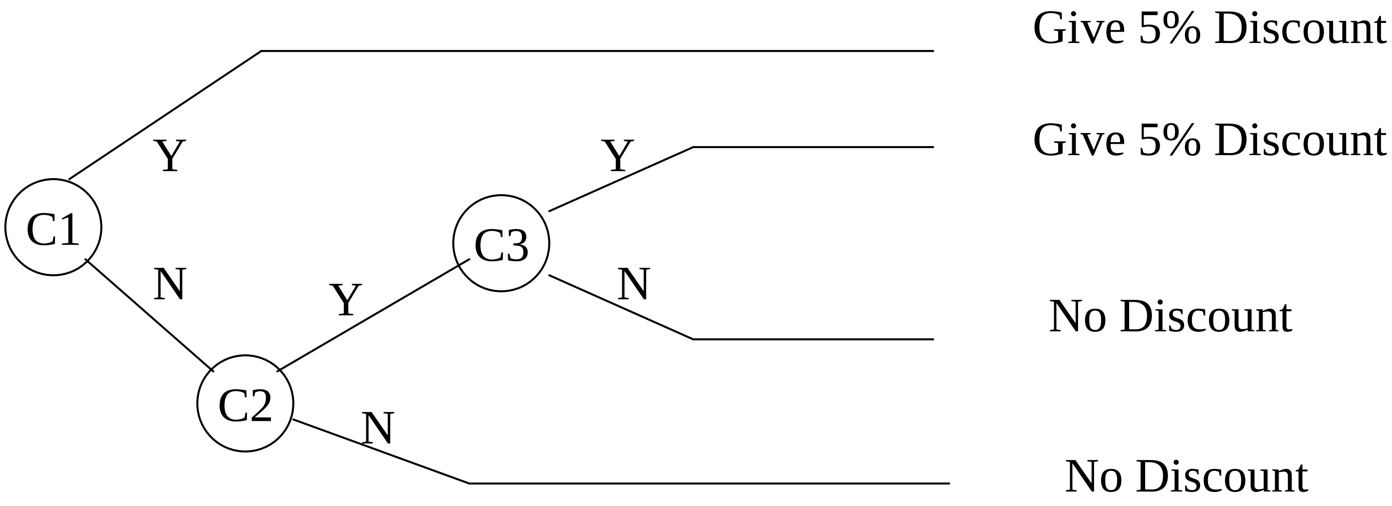
Keywords : if, then, else, repeat, until, while, do, case,

until, while, do, case, for, search, retrieve, read, write

- Delimiters – {, }, end, end if, end for

DECISION TREE-EXAMPLE

- The structured English procedure given in 6.1.3 is expressed as a Decision tree below



C1: Advance payment made
C2: Purchase amount >=10,000
C3: Regular Customer

Y = Yes
N = No

STRUCTURED ENGLISH-DECISION STRUCTURES

```
If condition
        then
            { Group of statements }
        else
            { Group of statements }
    end if

Example: if(balance in account >= min.balance)
             then    honor request
             else    reject request
         end if
```

STRUCTURED ENGLISH-CASE STATEMENT

Case (variable)

Variable = P: { statements for alternative P}

Variable = Q: { statements for alternative Q}

Variable = R: { statements for alternative R}

None of the above: { statements for default case}

end case

Example : Case(product code)

product code =1 : discount= 5%

product code =2 : discount =7%

None of the above : discount=0

end case

STRUCTURED ENGLISH-REPETITION STRUCTURE

```
for index = initial to final do
            { statements in loop }
end for

Example : Total =0
            for subject =1 to subject =5 do
               total marks=total marks +marks(subject)
               write roll no,total marks
            end for
```

STRUCTURED ENGLISH-WHILE LOOP

```
while condition do
        { statements in loop }
 end while

Example : while there are student records left to do
                    read student record
                        compute total marks
                        find class
                    write total marks, class, roll no
               end while
```

EXAMPLE

Update inventory file

```
for each item accepted record do
    { search inventory file using item code
      if successful
        then { update retrieved inventory record;
               write updated record in inventory file using accepted record}
        else { create new record in inventory file;
                enter accepted record in inventory file}
     end if
end for
```

DECISION TABLE-MOTIVATION

- A procedural language tells how data is processed
- Structured English is procedural
- Most managers and users are not concerned how data is processed-they want to know what rules are used to process data.
- Specification of what a system does is non-procedural.
- Decision Tables are non-procedural specification of rules used in processing data

ADVANTAGES OF DECISION TABLE

- Easy to understand by non-computer literate users and managers

- Good documentation of rules used in data processing.

- Simple representation of complex decision rules .

- Tabular representation allows systematic validation of specification
  detection of redundancy,incompleteness & inconsistency of rules

- Algorithms exist to automatically convert decision tables to
  equivalent computer programs.

- Allows systematic creation of test data

METHOD OF OBTAINING DECISION TABLE FROM WORD STATEMENT OF RULES

EXAMPLE

A bank uses the following rules to classify new accounts
If depositor's age is 21 or above and if the deposit is Rs 100 or more, classify the account type as A If the depositor is under 21 and the deposit is Rs 100 or more, classify it as type B If the depositor is 21 or over and deposit is below Rs 100 classify it as C If the depositor is under 21 and deposit is below Rs 100 do-not open account

Identify Conditions: Age >= 21 Cl
Deposits >= Rs 100: C2

Identify Actions : Classify account as A, B or C
Do not open account

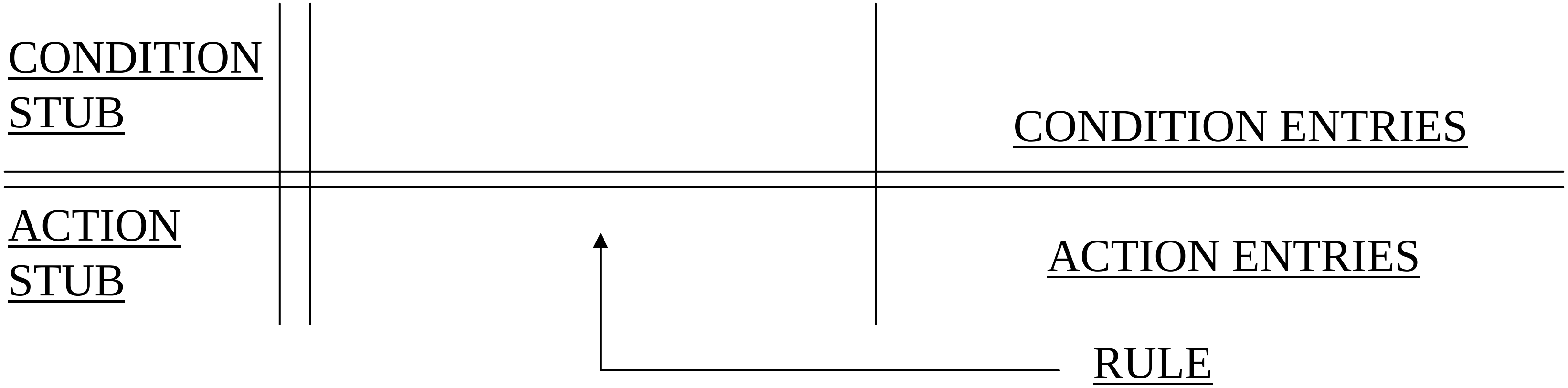
DECISION TABLE FROM WORD STATEMENT

Condition Stub

CODITIONS	Rule 1	Rule 2	Rule 3	Rule 4
C1 : Age >= 21	Y	N	Y	N
C2: Deposit >=100	Y	Y	N	N
ACTIONS				
A1: Classify as A	X	-	-	-
A2: Classify as B	-	X	-	-
A3: Classify as C	-	-	X	-
A4: Do not open Account	-	-	-	X

Action Stub

DECISION TABLE NOTATION EXPLAINED



- 4 Quadrants-demarcated by two double lines
- CONDITION STUB LISTS ALL CONDITIONS TO BE CHECKED
- ACTION STUB LISTS ALL ACTIONS TO BE CARRIED OUT
- LIMITED ENTRY DECISION TABLE:ENTRIES ARE Y or N or -.Y-YES,N-NO,-IRRELEVANT(DON'T CARE)
- X against action states it is to be carried out.
- -against action states it is to be ignored.
- Entries on a vertical column specifies a rule

DECISION TABLE NOTATION -CONTD

- ORDER OF LISTING CONDITIONS IRRELEVANT
i.e. CONDITIONS MAY BE CHECKED IN ANY ORDER

- ORDER OF LISTING ACTIONS IMPORTANT

- ACTIONS LISTED FIRST CARRIED OUT FIRST

SEQUENTIAL EXECUTION OF ACTIONS

- RULES MAY BE LISTED IN ANY ORDER

INTERPRETING DECISION TABLE-ELSE RULE

	R1	R2	ELSE
C1: Is applicant sponsored	Y	Y	
C2: Does he have min qualification	Y	Y	
C3: Is fee paid?	Y	N	
A1: Admit letter	X	-	-
A2: Provisional Admit letter	-	X	-
A3: Regret letter	-	-	X

Interpretation

R1: If applicant sponsored and he has minimum qualifications and his fee is paid –Send Admit letter

R2: If applicant sponsored and has minimum qualifications and his fee not paid send provisional admit letter

ELSE: In all cases send regret letter.The else rule makes a decision table complete

DECISION TABLE FOR SHIPPING RULES

	R1	R2	R3	R4
C1: Qty ordered <= Quantity in stock?	**Y**	**Y**	**N**	**N**
C2: (Qty in stock-Qty ordered)<=reorder level	**N**	**Y**	**-**	**-**
C3: Is the partial shipment ok?	**-**	**-**	**Y**	**N**
A1:Qty shipped=Qty ordered	**X**	**X**	**-**	**-**
A2:Qty shipped=Qty in stock	**-**	**-**	**X**	**-**
A3:Qty shipped=0	**-**	**-**	**-**	**X**
A4:Qty in stock=0	**-**	**-**	**X**	**-**
A5:Back order=qty ordered- qty shipped	**-**	**-**	**X**	**X**
A6:Initiative reorder procedure	**-**	**X**	**X**	**X**
A7: Qty in stock←Qty in stock -Qty shipped	**X**	**X**	**-**	**-**

EXTENDED ENTRY DECISION TABLE

- Condition Entries not necessarily Y or N
- Action entries not necessarily X or -
- Extended Entry Decision Tables(EEDT) more concise
- EEDT can always be expanded to LEDT

Example	R1	R2	R3	R4	R5	R6
C1 : Product code	**1**	**1**	**1**	**1**	**1**	**2**
C2 : Customer code	**A**	**B**	**A**	**B**	**C**	**-**
C3 : Order amount	**<=500**	**<=500**	**>500**	**>500**	**-**	**-**
Discount =	**5%**	**7.5%**	**7.5%**	**10%**	**6%**	**5%**

MIXED ENTRY DECISION TABLE

Can mix up Yes, No answers with codes

	Rl	R2	R3	R4	R5	R6
Cl : Product code = 1?		Y	Y	Y	Y	N
C2: Customer code =	A	B	A	B	C	-
C3: Order amount < 500?	Y	Y	N	N	-	-
Discount =	5%	7 5%	7 5%	10%	6%	5%

Choice of LEDT, EEDT, MEDT depends on ease of communication with user, software available to translate DTs to programs, ease of checking etc.

LINKED DECISION TABLE

Decision table 1

Salary point=6	**N**	**e**
Conduct OK?	**Y**	**l**
Diligence OK?	**Y**	**s**
Efficiency OK?	**Y**	**e**
Go to table 2	**X**	**-**
No promotion	**-**	**X**

Decision table 2

Salary point>2	**N**	**N**	**N**	**Y**
1 yr as class 1 officer	**Y**	**N**	**-**	**-**
Departmental test Passed?	**Y**	**-**	**N**	**-**
Advance to next salary point	**X**	**-**	**-**	**-**
No promotion	**-**	**X**	**X**	**-**
Go to Table3	**-**	**-**	**-**	**X**

Decision table3

Complete departmental Course	**Y**	**else**
1 yr since last increment	**Y**	
Advance to next salary point	**X**	**-**
No promotion	**-**	**X**

1.Observe that one can branch between tables

2. Whenever complex rules are given it is a good idea to break them up into manageable parts

LOGICAL CORRECTNESS OF DECISION TABLE

Consider decision table DTI:

	Rl	**R2**
Cl: x>60	**Y**	**-**
C2:x<40	**-**	**Y**
Al	**X**	**-**
A2 :	**-**	**X**

We can expand decision table by replacing each –by Y & N

DT2:

	R11	**R12**	**R21**	**R22**
Cl: x>60	**Y**	**Y**	**N**	**Y**
C2:x<40	**Y**	**N**	**Y**	**Y**
Al	**X**	**X**	**-**	**-**
A2 :	**-**	**-**	**X**	**X**

A rule which has no – is an Elementary rule

DT2 is an Elementary Rule Decision Table (ERDT)

<u>LOGICAL CORRECTNESS OF DECISION TABLE (CONTD)</u>

- **A decision table with 1 condition should have 2 elementary rules**
- **Each elementary rule must be distinct**
- **Each elementary rule must have distinct action**
- **If a decision table with k conditions does not have 2^k rules specified it is said to be <u>incomplete</u>**
  For example : DT2 does not have the elementary rule C1:N, C2:N.
- **It is thus incomplete.**
- **If the decision table has the same elementary rule occurring more than once it is said to have <u>multiplicity of specifications</u>**
  For Example:In DT2 The rule C1:Y,C2:Y occurs twice.Thus it has multiplicity of specification

LOGICAL CORRECTNESS OF DECISION TABLE (CONTD)

- If action specified for multiple identical rules are different then it is called <u>ambiguous specifications</u>
  DT2 has an ambiguity.Rules R_{11} and R_{21} are identical but have different actions

- Ambiguity may be apparent or real

- It is said to be apparent if the rule leading to the ambiguity is logically impossible

- For example,(x>60)=Y and (x<40)=Y cannot occur simultaneously.
  Thus in DT2 rules R11 and R22 are apparently ambiguous rules

- Apparently ambiguous rules is <u>not</u> an error

LOGICAL CORRECTNESS OF DECISION TABLE (CONTD)

If an apparently ambiguous specification is real then it is a <u>contradiction</u>

For example : If C1:(X > 60) = Y and C2:(X > 40) = Y then X = 70 will satisfy both inequalities.

As two actions are specified for (Cl = Y, C2 = Y) and they are different the rule is really ambiguous and is called <u>Contradictory Specification.</u>

LOGICAL CORRECTNESS OF DECISION TABLE (CONTD)

- **If all 2^k elementary rules are not present in a k condition decision table is said to be <u>incomplete.</u>**

- **DT2 (PPT 6.3.1) is incomplete as rule C1:N, C2:N is missing**

- **Rule C1=N, C2:=N is logically possible as C1=N is X<=60 and C2=N is X >= 40. A value of X = 50 will make C1=N,C2=N Thus DT2 has a <u>real</u> incomplete specification**

- **A decision table which has no real ambiguities or real <u>incompleteness</u> is said to be logically correct**

- **A decision table with logical errors should be corrected**

USE OF KARNAUGH MAPS

- **KARNAUGH map abbreviated K-map is a 2 dimensional diagram with one square per elementary rule**
- **The k-map of DT2 is**

C2 \ C1	N	Y
N	**?**	**Al**
Y	**A2**	**A1,A2**

- **If more than one action is in one square it is an ambiguous rule**
- **If a square is empty it signifies incomplete specification**

USE OF KARNAUGH MAPS

Structured English procedure:

```
If carbon content<0.7
  then if Rockwell hardness>50
          then if tensile strength>30000
                  then steel is grade 10
                  else steel is grade 9
                end if
          else steel is grade 8
          end if
  else steel is grade 7
 end if
```

Decision table-Grading steel

C1:Carbon content <0.7	**Y**	**Y**	**Y**	**N**	**Y**	**N**	**N**	**N**
C2:Rockwell hardness>50	**Y**	**Y**	**N**	**N**	**N**	**Y**	**Y**	**N**
C3 tensile strength>30000	**Y**	**N**	**N**	**N**	**Y**	**Y**	**N**	**Y**
Grade	10	9	8	7	?	?	?	?

KARNAUGH MAPS – GRADING STEEL

C3 \ C1 C2	NN	NY	YY	YN
N	7	?	9	8
Y	?	?	10	?

- **The 3 conditions are independent**
- **The decision table is thus incomplete**
- **Observe that in the Structured English specifications the incompleteness is not obvious**

DECISION TABLE-ARREARS MANAGEMENT

	R1	R2	R3	R4	R5	R6
C1:Payment in current month >min.specified payment	Y	N	N	-	-	-
C2:Payment in current month>0	-	Y	Y	-	N	N
C3:Any payment in last 3 months	-	-	-	N	Y	Y
C4: Actual arrears > 3(min. Specified payment per month)	-	Y	N	Y	N	Y
A1 : Send letter A	X	-	-	-	-	-
A2 : Send letter B	-	X	-	-	-	-
A3 : Send letter C	-	-	X	-	-	-
A4 : Send letter D	-	-	-	X	-	X
A5 : Send letter E	-	-	-	-	X	-

KARNAUGH MAP

C3C4 \ C1C2	NN	NY	YY	YN
NN	?	A3	A1	A1*
NY	A4	A2A4+	A1A4+	A1A4*
YY	A4	A2	A1	A1A4*
YN	A5	A3	A1	A1A5*

K – Map for decision table

C1 : x>m C2:x>0 C3:y>0 C4:z>3m m>0
C3,C4 independent of C1,C2 C1,C2 dependent
C1: Y C2: Y x>m, x>0 possible
C1: Y C2: N x>m, x<=0 not logically possible
C1: N C2: Y x<=m,x>0 possible
C1: N C2: N x<=m,x<=0 possible
Thus C1,C2,C3 C4:NNNN incomplete specification
BOXES MARKED * NOT LOGICALLY POSSIBLE
Rules C1 C2 C3 C 4 : NYNY and YYNY logical errors
Errors to be corrected after consulting users who formulated the rules

CORRECT DECISION TABLE

- **If users say that for rules C1C2C3C4:NYNY AND YYNY (marked with + in k-map) the action is A4 and for C1C2C3C4:NNNN also it is A4, the corrected map is**

C3C4 \ C1C2	NN	NY	YY	YN
NN	A4	A3	A1	
NY	A4	A4	A4	
YY	A4	A2	A1	
YN	A5	A3	A1	

Impossible rules

CORRECTED DECISION TABLE

C1	**Y**	**Y**	**Y**	**N**	**N**	**N**	**N**	**Y**	**N**	**N**	**N**	**N**
C2	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**N**	**N**
C3	**N**	**Y**	**Y**	**Y**	**N**	**Y**	**N**	**N**	**Y**	**N**	**N**	**Y**
C4	**N**	**Y**	**N**	**Y**	**N**	**N**	**Y**	**Y**	**Y**	**Y**	**N**	**N**
Action	**A1**	**A1**	**A1**	**A2**	**A3**	**A3**	**A4**	**A4**	**A4**	**A4**	**A4**	**A5**

Question: Can the number of rules be reduced
Answer : Yes, by combining rules with the same action

Action A1 can be represented by the Boolean expression:

$$C1C2\overline{C3}\,\overline{C4} + C1C2C3\overline{C4} + C1C2C3C4 = C1C2\overline{C3}\,\overline{C4} + C1C2C3\,(C4+\overline{C4})$$
$$= C1C2\overline{C3}\,\overline{C4} + C1C2C3 = C1C2\overline{C4} + C1C2C3$$

REDUNDANCY ELIMINATION

- Redundancy can be eliminated by systematically applying four identities of Boolean Algebra
- These identities are

$$A + \overline{A} = 1$$

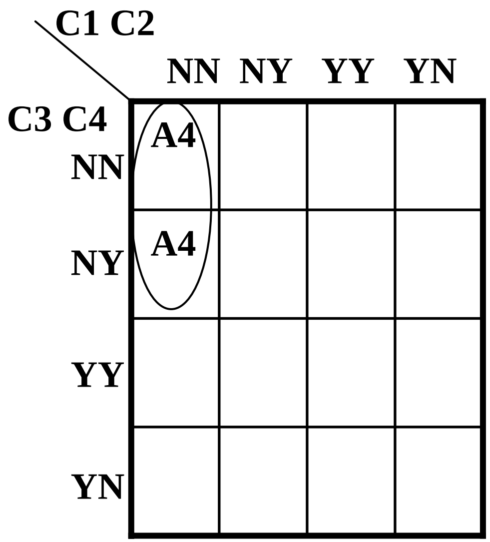
$$1.A = A$$

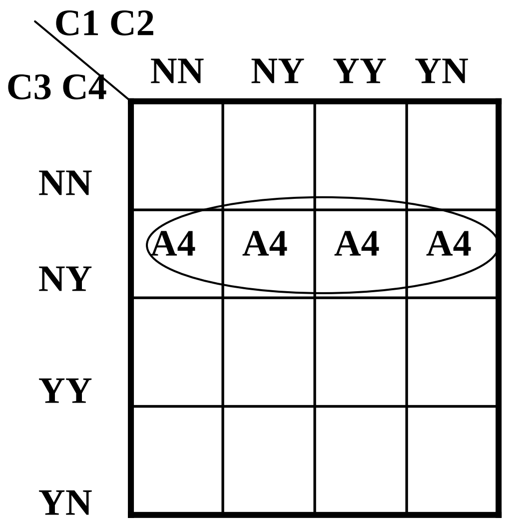
$$A + A = A$$

$$1 + A = 1$$

- K-map assists in identifying Boolean terms in which One or more variables can be eliminated
- K-map is constructed in such a way that two boxes which are physically adjacent in it are also logically adjacent

KARNAUGH MAP REDUCTION



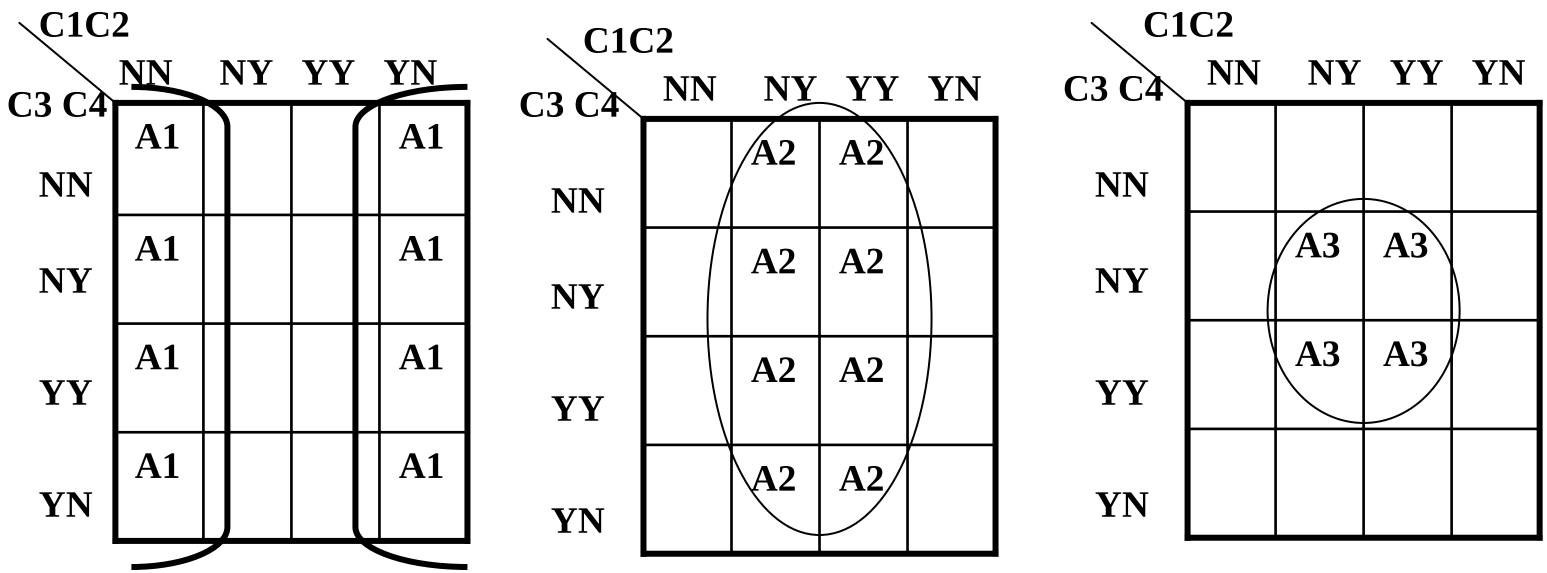


$A4=\overline{C1}\,\overline{C2}\,\overline{C3}(\overline{C4}+C4)=\overline{C1}\,\overline{C2}\,\overline{C3}$

$A4=\overline{C3}C4(\overline{C1}\,\overline{C2}+\overline{C1}C2+C1C2+C1\overline{C2})=\overline{C3}C4$

- Combining 2 adjacent boxes eliminates 1 variable
- Combining 4 adjacent boxes eliminates 2 variable
- Combining 8 adjacent boxes eliminates 3 variable
- First and last columns of k-map are logically adjacent
- First and last rows are also logically adjacent

KARNAUGH MAP REDUCTION



$A1=(\overline{C3}\,\overline{C4}+\overline{C3}C4+C3C4+C3\overline{C4}).(\overline{C1}\,\overline{C2}+C1\overline{C2})=\overline{C2}(\overline{C3}+C3)=\overline{C2}$

$A2=(\overline{C1}C2+C1C2)(\overline{C3}\,\overline{C4}+\overline{C3}C4+C3C4+C3\overline{C4})=C2$

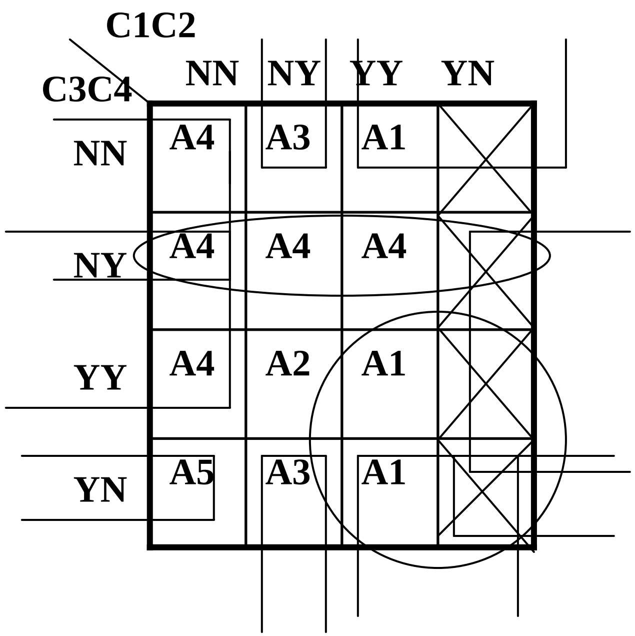
$A3=\overline{C1}C2\overline{C3}C4+C1C2\overline{C3}C4+\overline{C1}C2C3C4+C1C2C3C4$

$=C2\overline{C3}C4(\overline{C1}+C1)+C2C3C4(\overline{C1}+C1)$

$=C2C4(\overline{C3}+C3)=C2C4$

REDUCING DECISION TABLES-USE OF K-MAP

This is the K-map corresponding to DT of 6.3.12



Boxes marked X correspond to impossible rules. They can be used if they are useful in reducing rules

Using k-map reduction rules we get

A1 : $C1\overline{C4}+C1C3$
A2 : $\overline{C1}C2C3C4$
A3 : $\overline{C1}C2\overline{C4}$
A4 : $\overline{C3}C4+\overline{C2}\,\overline{C3}+\overline{C2}C4$
A5 : $\overline{C2}C3\overline{C4}$

REDUCING DECISION TABLES

REDUCED DECISION TABLE for DT of 6.3.12

C1: Payment in current month > min specified payment	**Y**	**Y**	**N**	**N**	**-**	**-**	**-**	**-**
C2: Payment in current month>0	**-**	**-**	**Y**	**Y**	**-**	**N**	**N**	**N**
C3: Any payment in last 3 months	**-**	**Y**	**Y**	**-**	**N**	**N**	**-**	**Y**
C4: Actual arrears> 3(minimum specified payment per month)	**N**	**-**	**Y**	**N**	**Y**	**-**	**Y**	**N**
A: Send letter A	**X**	**X**	**-**	**-**	**-**	**-**	**-**	**-**
B: Send letter B	**-**	**-**	**X**	**-**	**-**	**-**	**-**	**-**
C: Send letter C	**-**	**-**	**-**	**X**	**-**	**-**	**-**	**-**
D: Send letter D	**-**	**-**	**-**	**-**	**X**	**X**	**X**	**-**
E: Send letter E	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**X**

EXAMPLE-REDUCTION OF RULES IN WORD STATEMENT

Rules : Insure Driver if following rules are satisfied

1. **Drivers annual income > 20000 & is married male**
2. **Drivers annual income > 20000 & is married and over 30**
3. **Drivers annual income <= 20000 & she is married female**
4. **Driver is male over 30**
5. **Driver is married and age is not relevant**

   Else do not insure

Conditions:

C1 : Annual income > 20000
C2 : Male
C3 : Married
C4: Age > 30

Action: Insure or do not insure

DECISION TABLE FOR INSURANCE RULES

Cl : Annual income> 20000	Y	Y	N	-	-	E
C2: Male	Y	-	N	Y	-	L
C3: Married	Y	Y	Y	-	Y	S
C4: Age > 30	-	Y	-	Y	N	E
A1:Insure	X	X	X	X	X	-
A2 :Do not insure	-	-	-	-	-	X

C3C4 \ C1C2	NN	NY	YY	YN
NN				
NY		A1	A1	
YY	A1	A1	A1	A1
YN	A1	A1	A1	A1

A1=C3+C2.C4

REDUCED DECISION TABLE

C2 : Male	-	Y	
C3 : Married	Y	-	ELSE
C4 : Age > 30	-	Y	
Al : Insure	X	X	-
A2 : Do not Insure	-	-	X

<u>Reduced rules :</u> **Insure if married or male over 30**

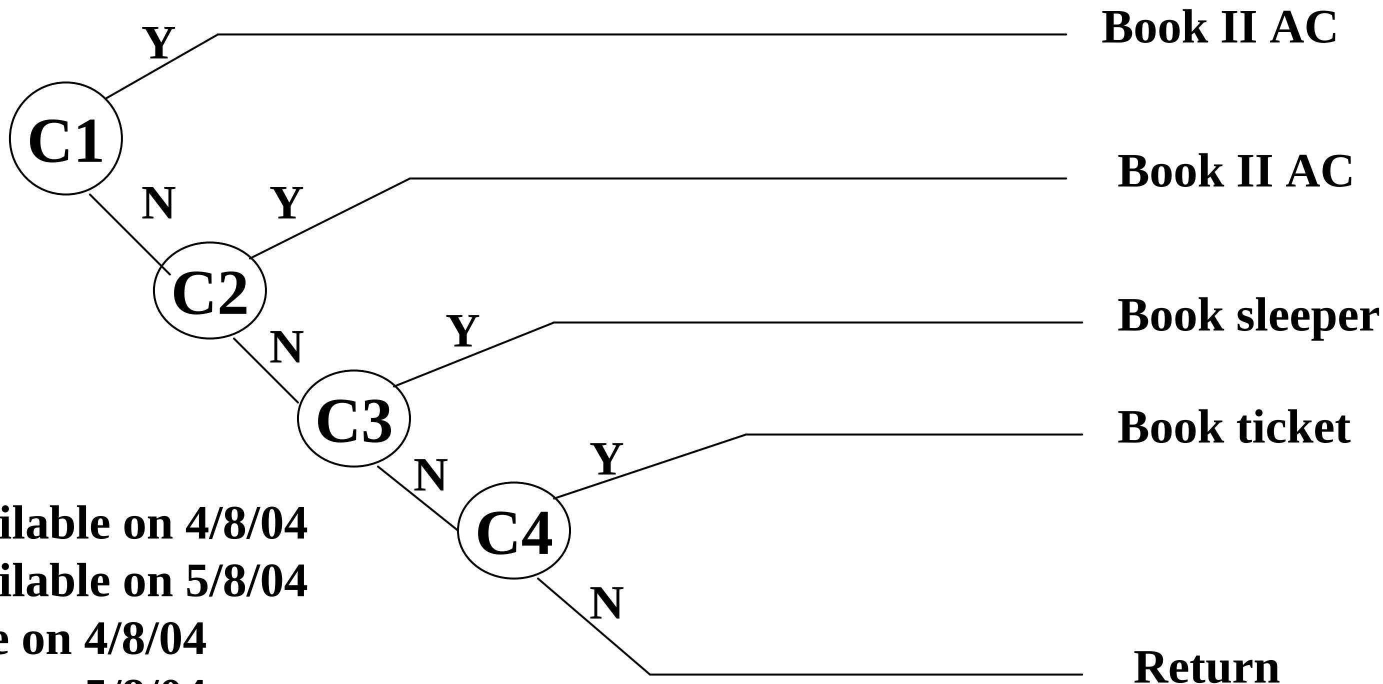
Observe 5 rules simplified to 2 and 1 condition removed

DECISION TREES

- **Used when sequence of testing condition is important**
- **It is more procedural compared to Decision tables**

EXAMPLE – DECISION TREE TO BOOK TRAIN TICKET

Book by II AC on 4/8/04 if available else book by II AC on 5/8/04.If both not available book by sleeper on 4/8/04 if available else book on 5/8/04 by sleeper.If none available return.

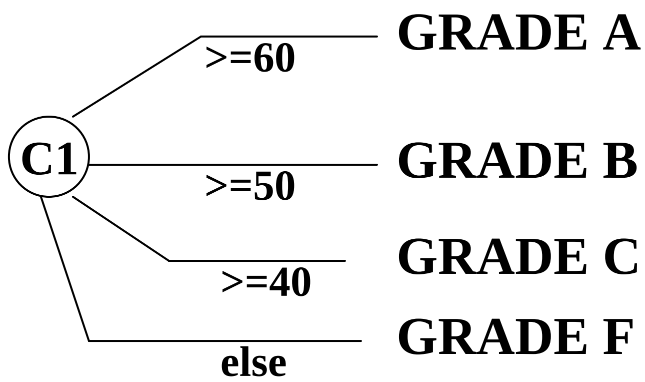


C1: Is II AC ticket available on 4/8/04
C2: Is II AC ticket available on 5/8/04
C3: Is sleeper available on 4/8/04
C4: Is sleeper available on 5/8/04
Observe in the tree sequencing of conditions which is important in this example

DECISION TREES

- Decision trees are drawn left to right
- Circles used for conditions
- Conditions labelled and annotation below tree
- Conditions need not be binary

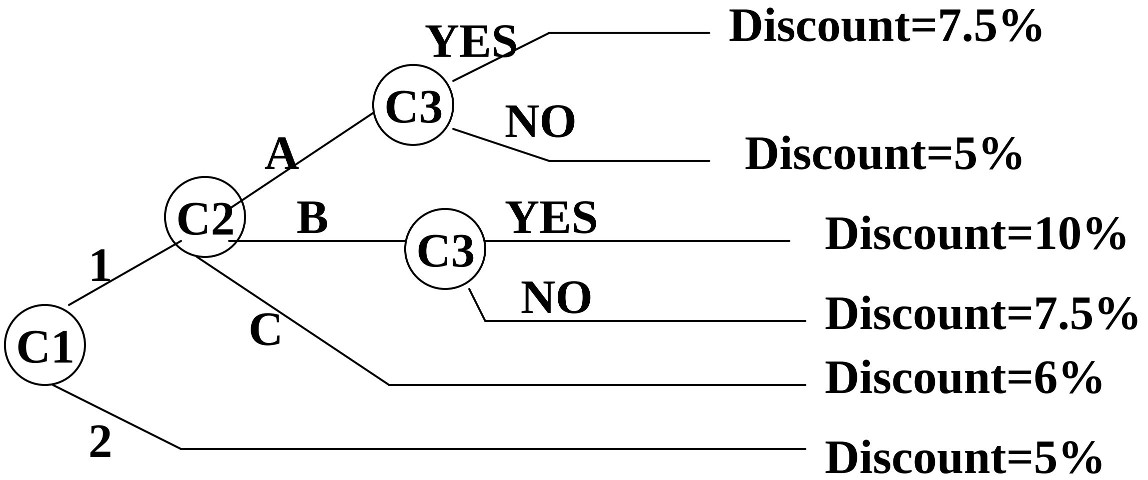
For example:



- Sometimes Decision trees are more appropriate to explain to a user how decisions are taken

DECISION TREES

Decision tree for decision table of 6.2.9 [Slide number 25]



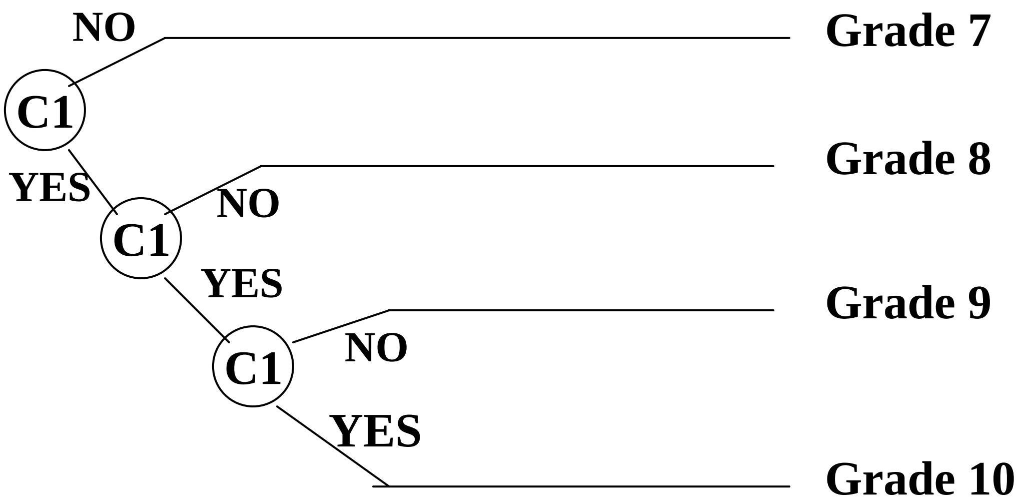
C1: PRODUCT CODE
C2 : CUSTOMER CODE
C3: ORDER AMOUNT >500?

- **Observe that the 3 alternatives for connection C2 shown as three branching lines**

SOME PEOPLE FIND DECISION TREE EASIER TO UNDERSTAND

DECISION TREES

Decision tree equivalent of structured English procedure of 6.3.7 (SLIDE 37) is given below



C1 : Carbon < 0.7
C2 : Rockwell hardness > 50
C3: Tensile strength > 3000

- **Observe incompleteness evident in the equivalent Decision Table is not evident in the Decision tree**
- **If the testing sequence is specified and is to be strictly followed the Decision tree is simple to understand.**

COMPARISON OF STRUCTURED ENGLISH, DECISION TABLES AND DECISION TREES

CRITERION FOR COMPARISON	STRUCTURED ENGLISH	DECISION TABLES	DECISION TREES
ISOLATING CONDITIONS & ACTIONS	NOT GOOD	BEST	GOOD
SEQUENCING CONDITIONS BY PRIORITY	GOOD	NOT GOOD	BEST
CHECKING FOR COMPLETENESS, CONTRADICTION & AMBIGUITIES	NOT GOOD	BEST	GOOD

WHEN TO USE STRUCTURED ENGLISH,DECISION TABLES AND DECISION TREES

- **Use Structured English if there are many loops and actions are complex**

- **Use Decision tables when there are a large number of conditions to check and logic is complex**

- **Use Decision trees when sequencing of conditions is important and if there are not many conditions to be tested**