



Testing

Lecture 2

White Box Testing Techniques Black Box Testing Techniques

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White-Box Testing

Any Testing Techniques Used To Test On The Internal Logical Structure (Code).

Refers To Verification.

Test Cases Are Generated Based On The Implemented Instructions or Statements.

STATEMENT & DECISION COVERAGE

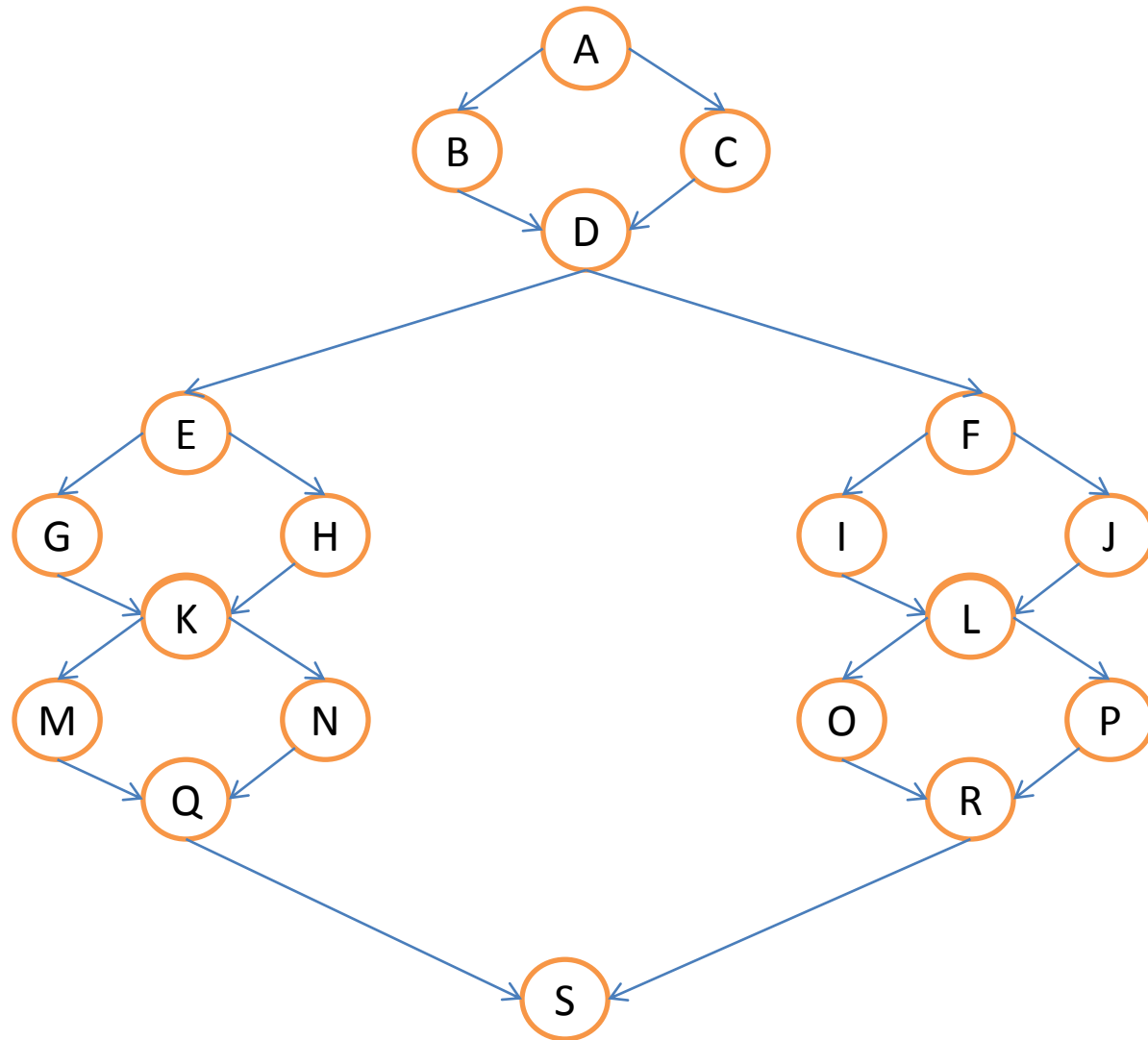
STATEMENT COVERAGE

- Test executable statements (Line of code) per test case.
- To measure statement coverage we use the following formula:
 - Statement Coverage =
$$\left(\frac{\text{No. of statements executed}}{\text{Total No. of executable statements}} \right) * 100$$
- Create a flow chart.
- Create tests which cover all the shapes.

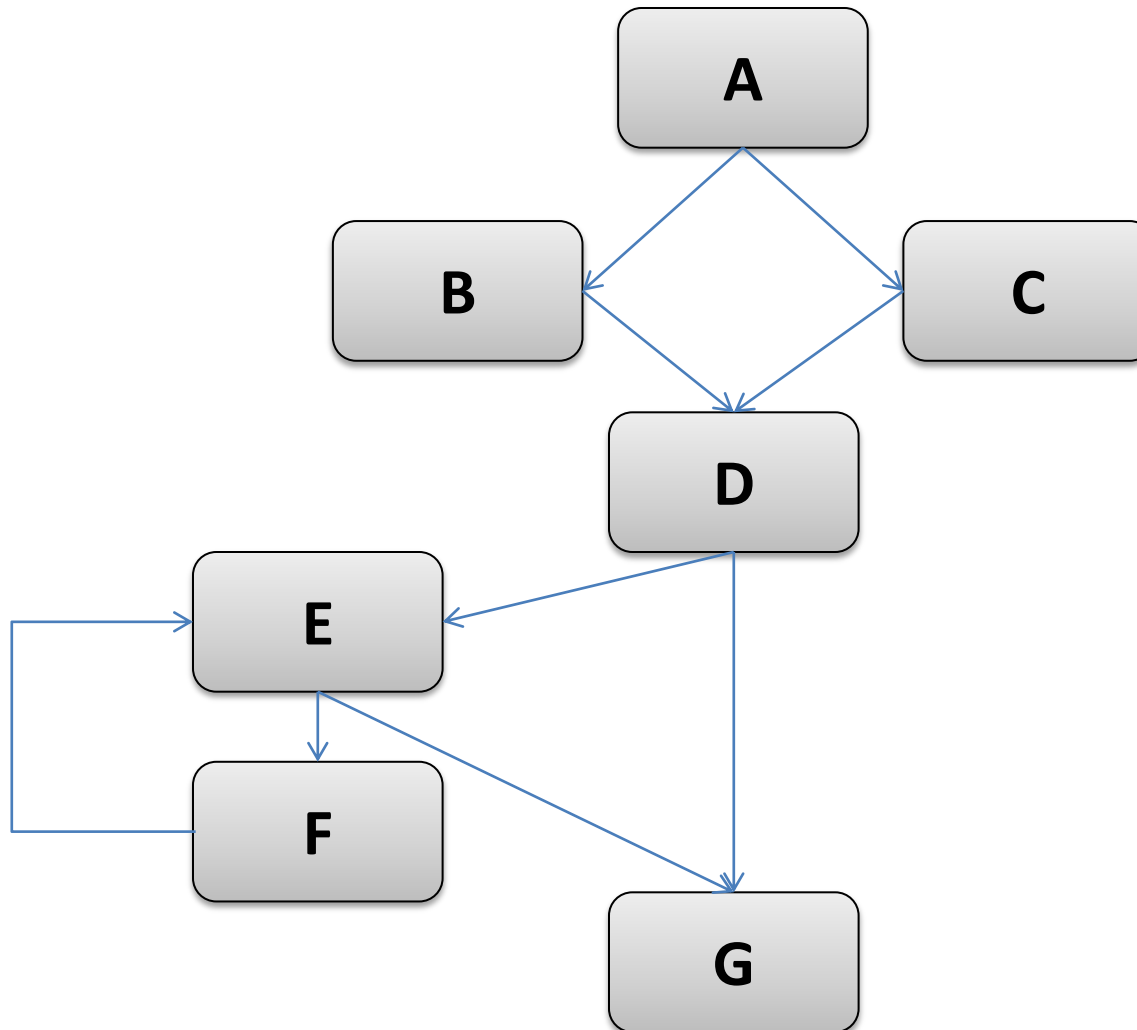
DECISION COVERAGE

- Test decision outcomes (true/false) per test case.
- 100% DC gives 100% SC (Statement Coverage).
- To measure decision coverage we use the following formula:
 - Decision Coverage =
$$\left(\frac{\text{No. of decision outcomes executed}}{\text{No. of decision outcomes}} \right) * 100$$
- Create a flow chart.
- Create tests which cover all the true & false.

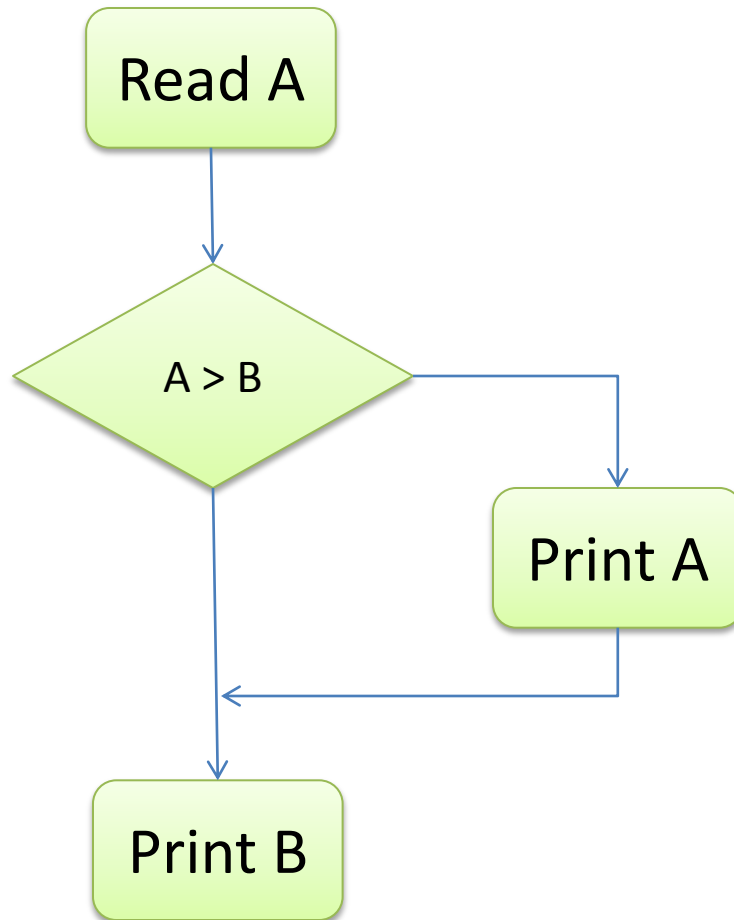
LAB 1

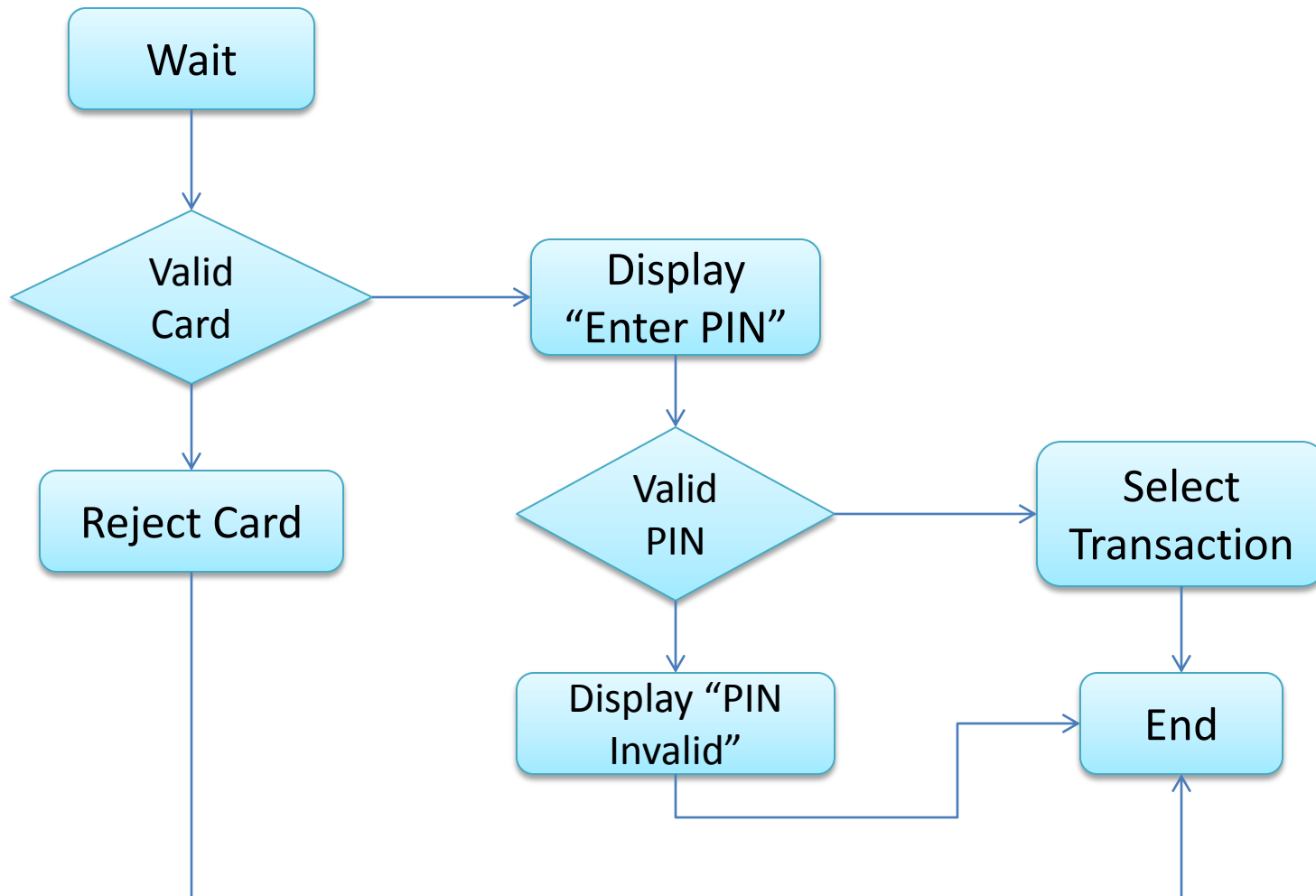


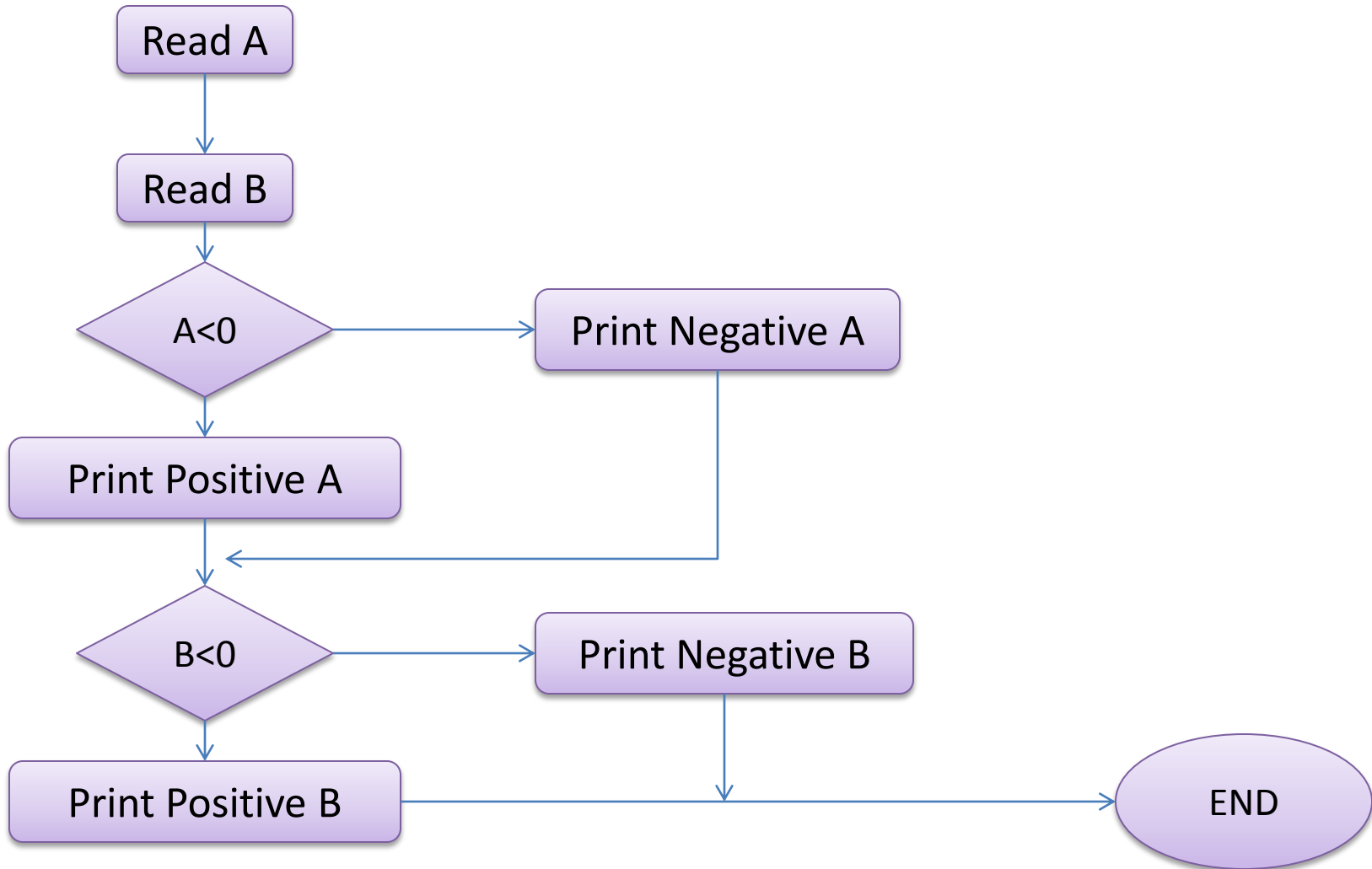
LAB 2

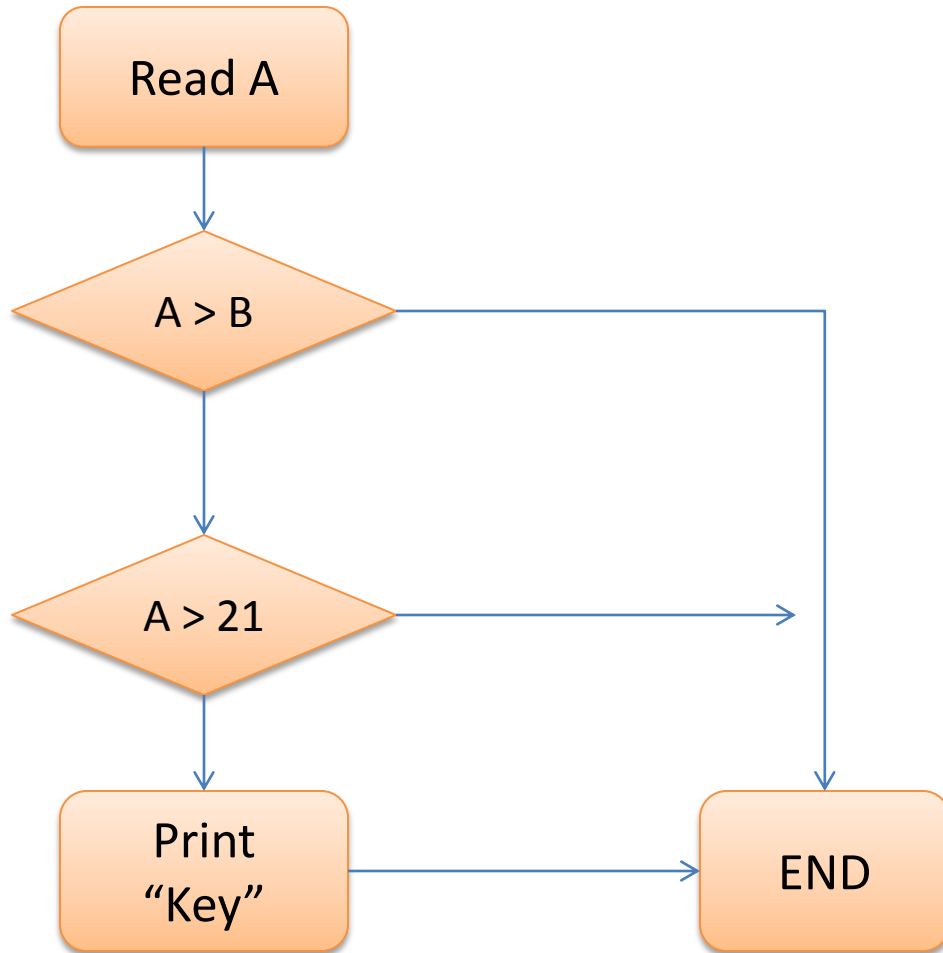


LAB 3









Lab 1

Statement Coverage = 4

Decision Coverage = 4

Lab 2

Statement Coverage = 2

Decision Coverage = 2

Lab 3

Statement Coverage = 1

Decision Coverage = 2

Lab 4

Statement Coverage = 3

Decision Coverage = 3

Lab 5

Statement Coverage = 2

Decision Coverage = 2

Lab 6

Statement Coverage = 1

Decision Coverage = 3

Black-Box Testing

Any Testing Techniques Used To Test On The Outermost Interface Of A Given System Without Looking Into The Implementation Details.

Refers To Validation.

Test Cases Are Generated Based On The Customer Requirements Or The SRS.

EQUIVALENCE PARTITIONING

- Used to reduce the number of test cases.
- The system treat a range of values as same.
- All test levels.
- Input & output coverage.
 - Human input, interfaces, internal values, time related

If the temperature falls below 18 degrees, the heating is switched on. When the temperature reaches 21, the heating is switched off. What is the minimum set of test input values to cover all valid equivalence partitions.

- a. 15, 19 & 25 degrees
- b. 17, 18, 20 & 21 degrees
- c. 18, 20 & 22 degrees
- d. 16 & 26 degrees

A candidate sits an exam with 40 questions. To pass, the candidate must answer at least 25 question correctly, to gain distinction, a mark of 32 or above must be achieved, which groups of exams scores would fall into three equivalence classes?

- a. 32, 36 , 40
- b. 0, 27, 36
- c. 0, 24, 32
- d. 25, 32, 40

Tax rates on income per are: 0% for up to 5000 USD, 10% is added for each additional 5000 USD up to 20000 USD, and 40% is applied for above 20,000 USD, which test inputs in USD would be selected for valid equivalence partitions?

- a. 3000 – 18000 - 30000
- b. 3000 – 8000 – 16000 – 20000 - 25000
- c. -1000 – 4000 – 9000 – 14000 - 19000
- d. 3000 – 6000 – 12000 – 19000 - 30000

BOUNDARY VALUE ANALYSIS

- Boundaries are an area where developers commonly make mistakes.
- All test levels.
- Partition – Boundaries – 2VA, 3VA

A banking system calculates interest rate for saving accounts as follows: 5% for amounts less than 100 EGP, 8% for less than 1000 EGP, and 10% for 1000 EGP or more. Which test inputs in EGP would be selected using BVA considering both valid and invalid boundary values?

- A. 0.00,0.01,99.99,100.00,100.01,999.99,1000.00,1000.01
- B. -0.01, 0.00,99.99,100.00,999.99,1000.00
- C. -0.01,99.99,100.00,999.99,1000.00
- D. 0.00,100.00,100.01,1000.00,1000.01

STATE TRANSITION

- The States that the software may occupy (On, Off).
- The Events that cause a transition.
- The Transitions form one state to another.
- The Actions that result from a transition.
- Each State = Test Condition

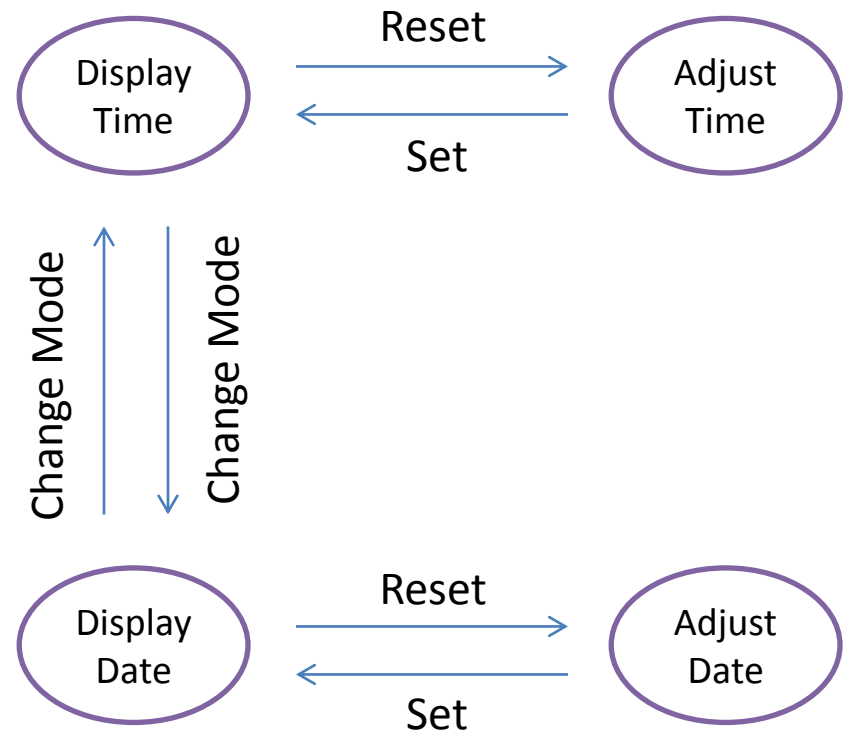
Electronic Clock Example

A Simple electronic clock has four modes, Display Time, Adjust Time, Display Date & Adjust Date.

The change mode button switches between display time & display date.

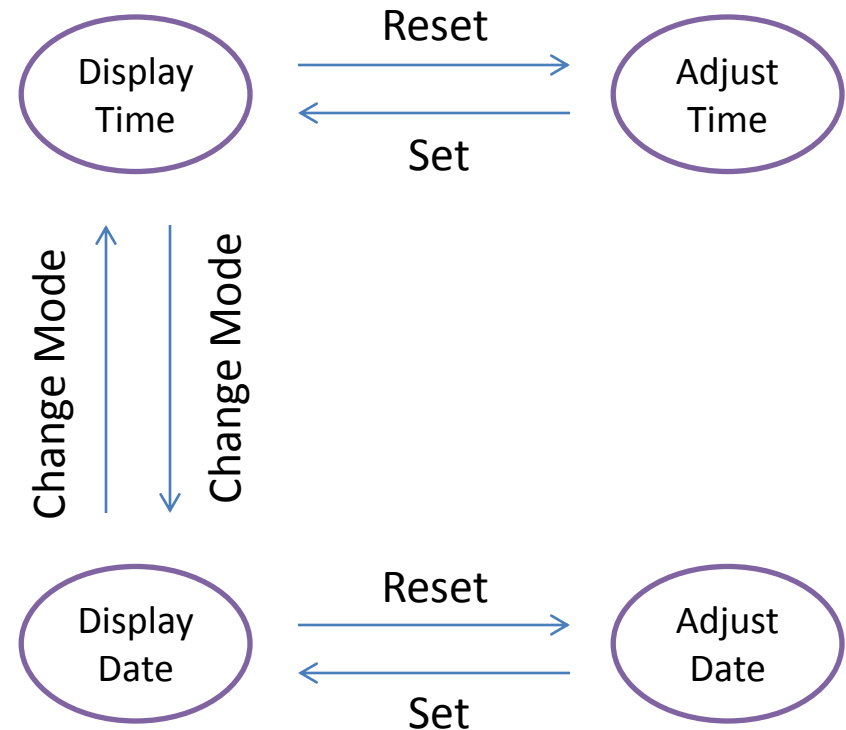
The reset button switches from display time to adjust time or display date to adjust date.

The set button returns from adjust time to display time or adjust date to display date.

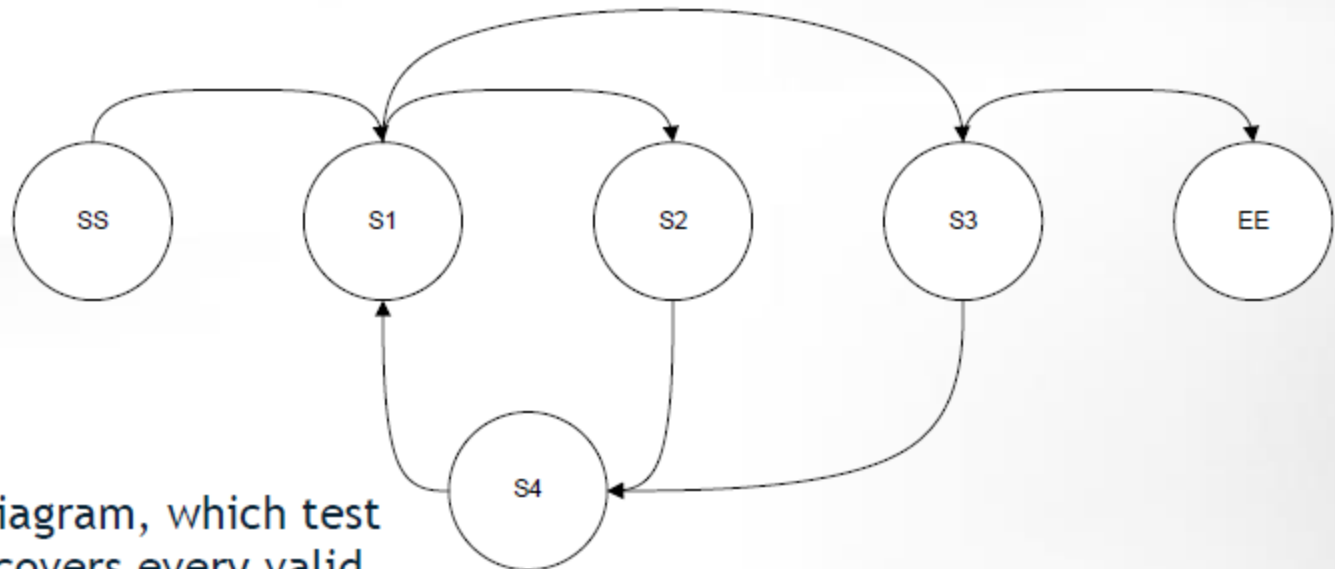


State Transition Matrix

Events / Modes	Change Mode	Set	Reset
AT	---	DT	---
DT	DD	---	AT
DD	DT	---	AD
AD	---	DD	---



Note* If The Number Of Valid Transition In The Table Equals The Number Of Arrows In The Diagram Then You Are 100% Sure That The Table Is Implemented Correctly.



Given this diagram, which test case below covers every valid transition?

- a. SS-S1-S2-S4-S1-S3-EE
- b. SS-S1-S2-S3-S4-S3-S4-EE
- c. SS-S1-S2-S4-S1-S3-S4-S1-S3-EE
- d. SS-S1-S4-S2-S1-S3-ES

DECISION TABLE

- Cause & effect.
- Requirements with logical conditions.
- Finding problems and ambiguities in the specification.
- Used to test the complex business rules.
- All test levels.
- Identify the conditions & actions.
- Calculate the rules.

New tax will be applied depending on the following conditions:

Income less than 1200 and not married & younger than 35, tax = 15%

Income less than 1200 and married and younger than 35, tax = 10%

Income less than 1200 and married and older than 35, tax = 5%

Else 20%

Discount is set at a flat rate of 10 % for all purchase amounts but with 2 exceptions. No discount is given for purchase amount below 1000 EGP. Also, purchase of 5 items or more and with total amount of 5000 or more gets 20% discount. **What is the number of test cases generated using decision table testing & when having one test case per each table rule & when “Do Not Care” is used as a possible value for conditions?**

Lab 1

Number of test cases using decision table testing = 8 test cases

Number of test cases when having one test case per each table rule = 8 test cases

Number of test cases after applying Don't Cares = 5 test cases

Lab 2

Number of test cases using decision table testing = 8 test cases

Number of test cases when having one test case per each table rule = 6 test cases

Number of test cases after applying Don't Cares = 4 test cases





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