Pressure Controller

[Learn in depth]

Mastering Embedded System 1st term project

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Represented by : Ibrahim Reda Elmsery

System Architecting /Deign sequence

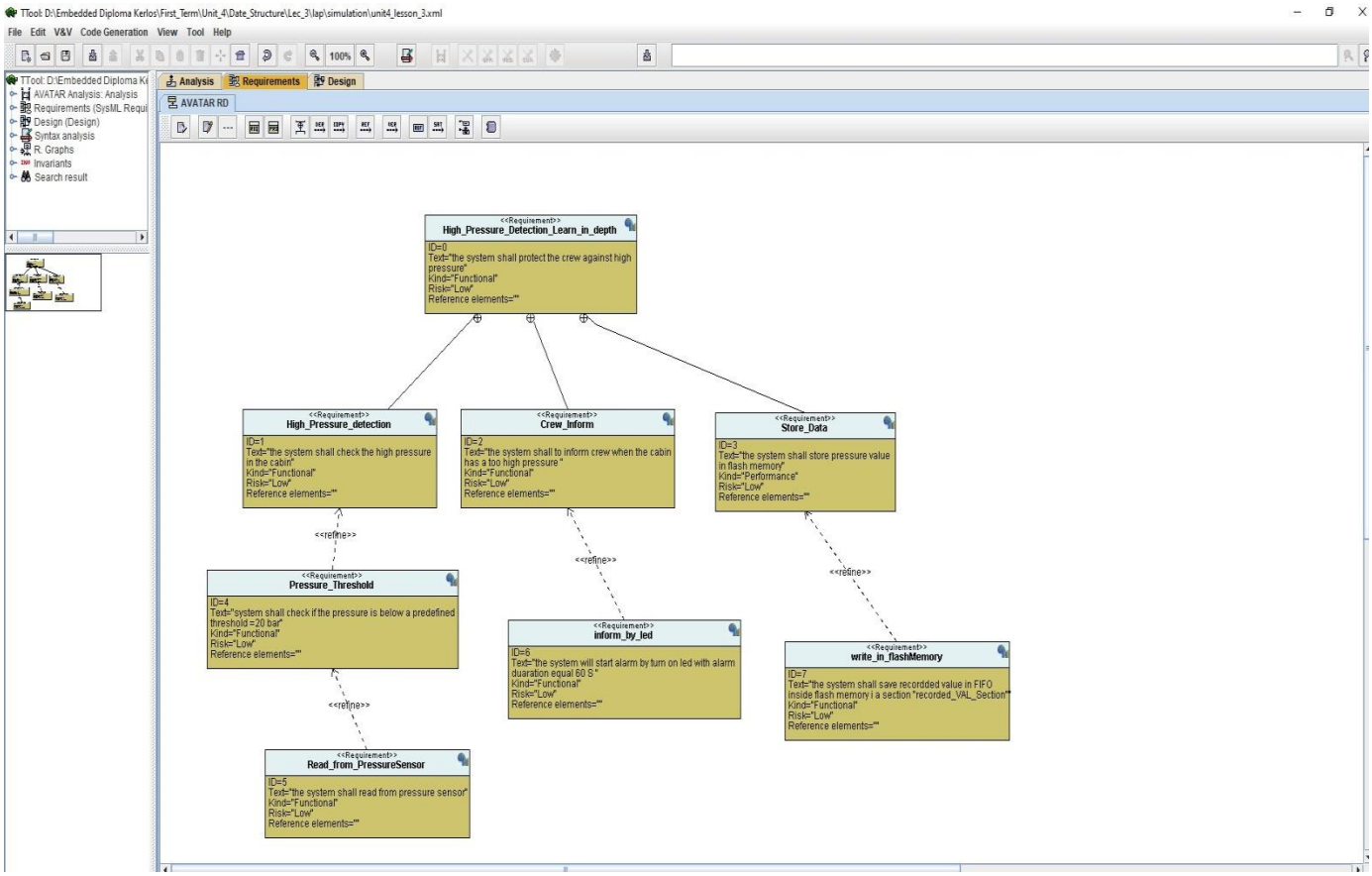
1-Case Study

Pressure controller detect pressure and if pressure higher than 20 bar it send alarm (LED) for 60 seconds and store reading in flash memory(optional) .

2-Method

V –Model

3-Requirement diagram

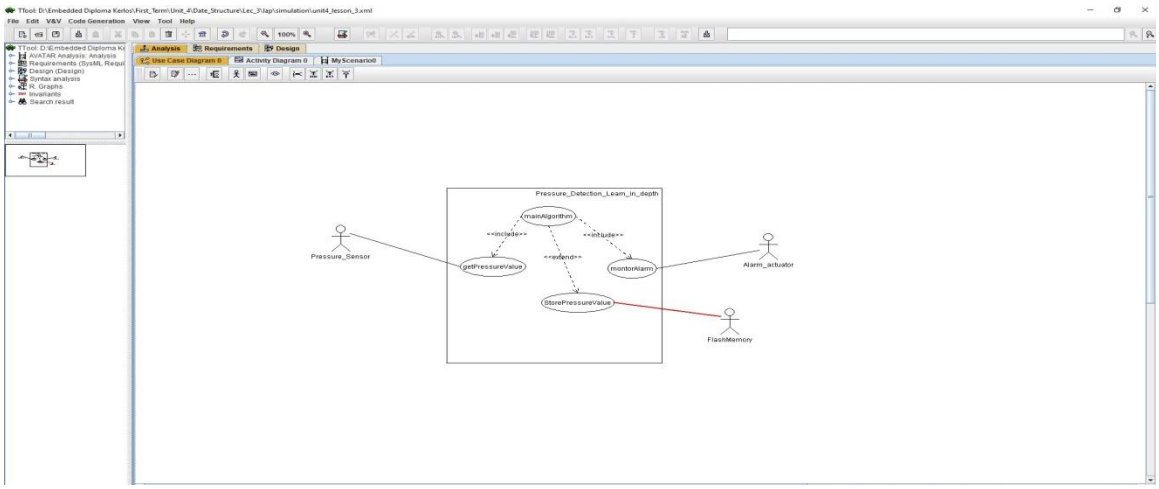


4-Microconroller

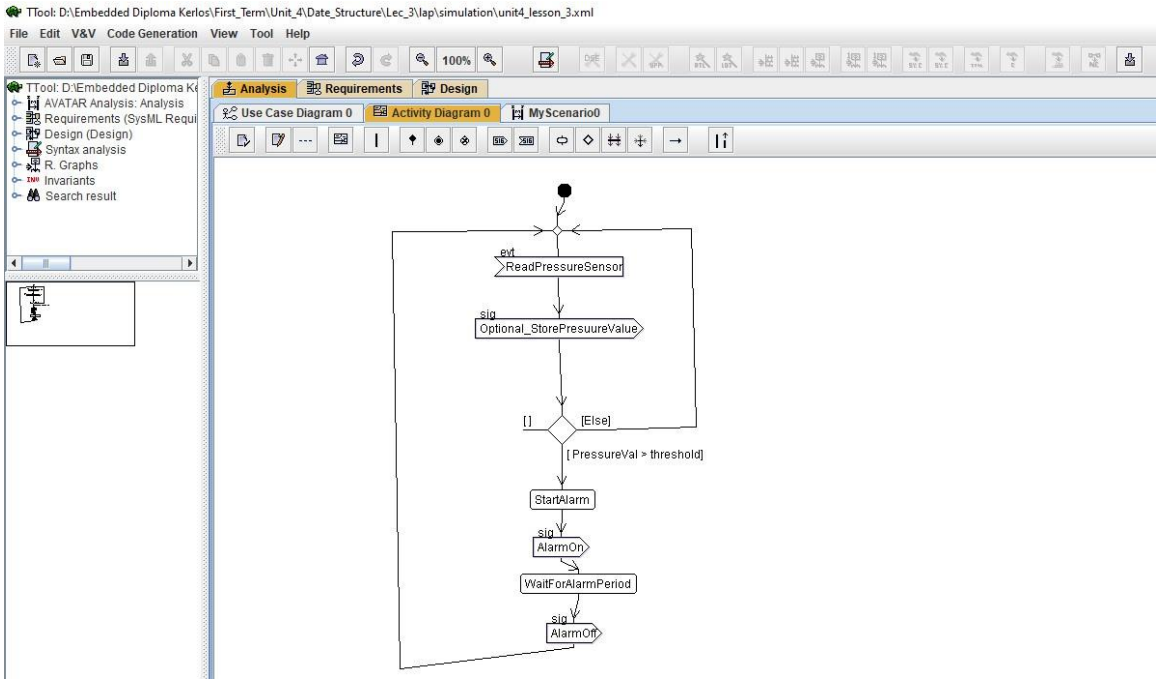
Stm32f103c6t6 (cortex m-3)

5-System analysis

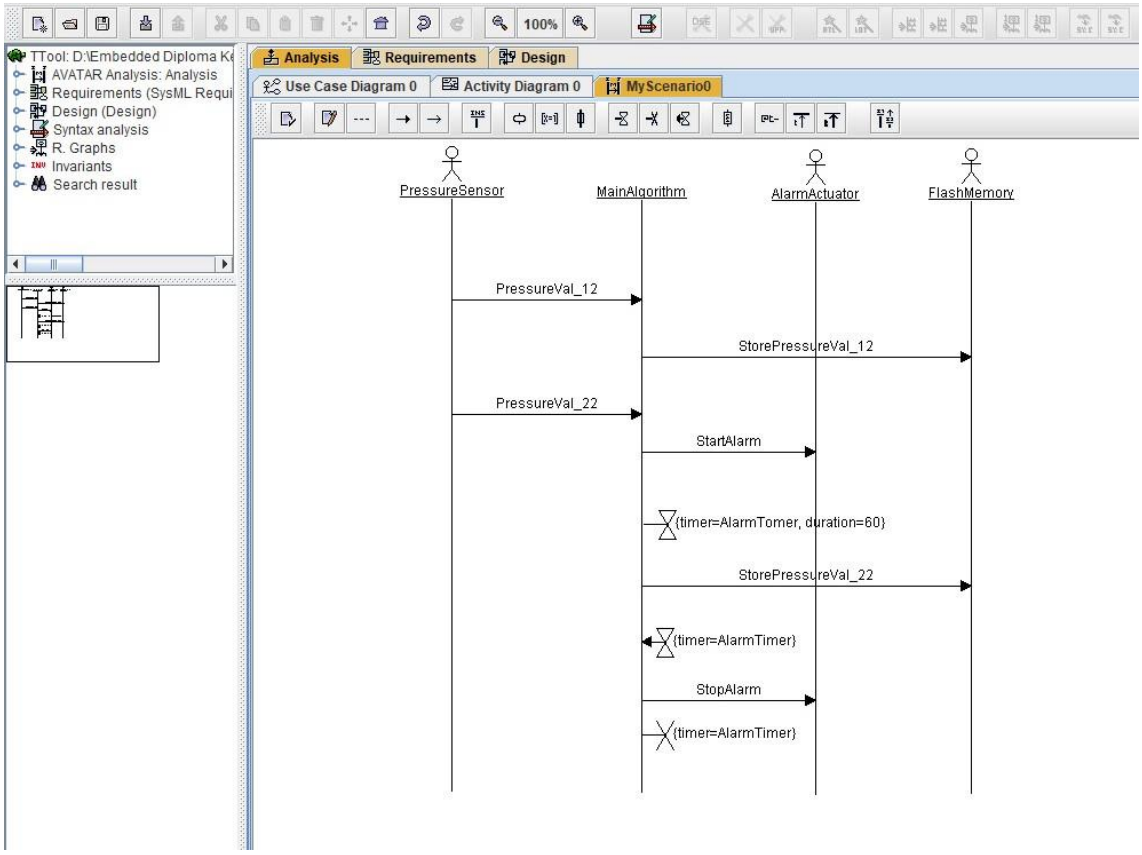
1-case diagram



1-Activity diagram

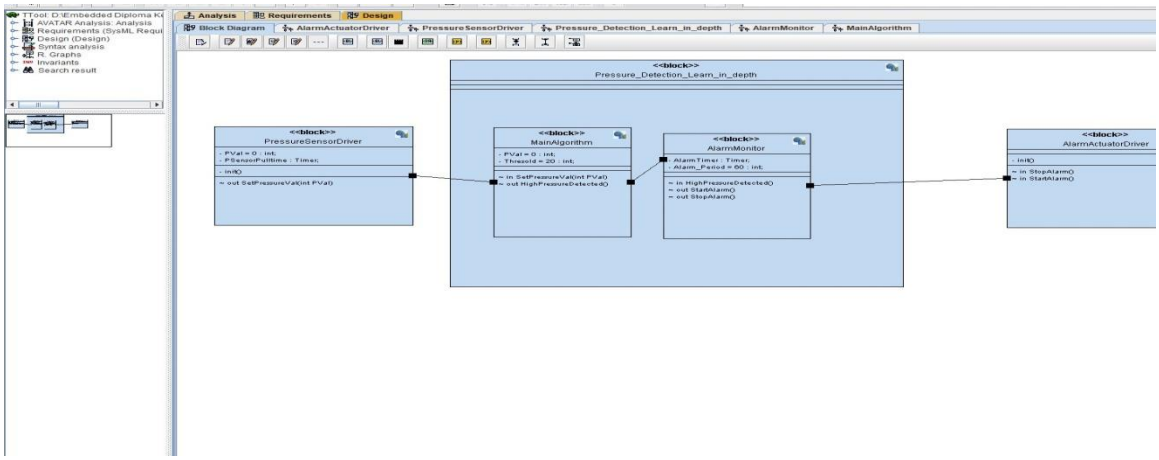


3-Scenario



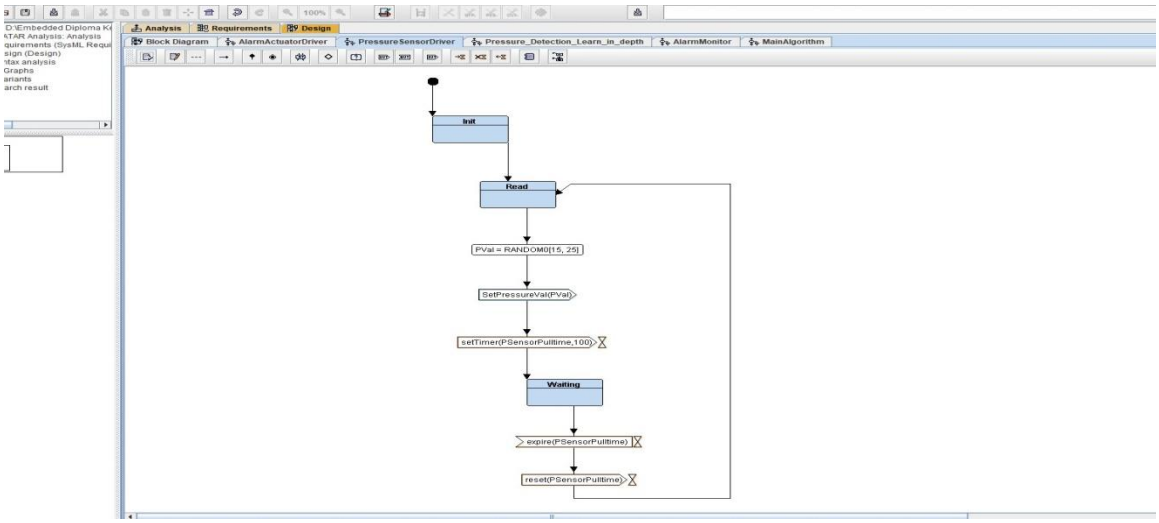
5-System design

1-Project block diagram

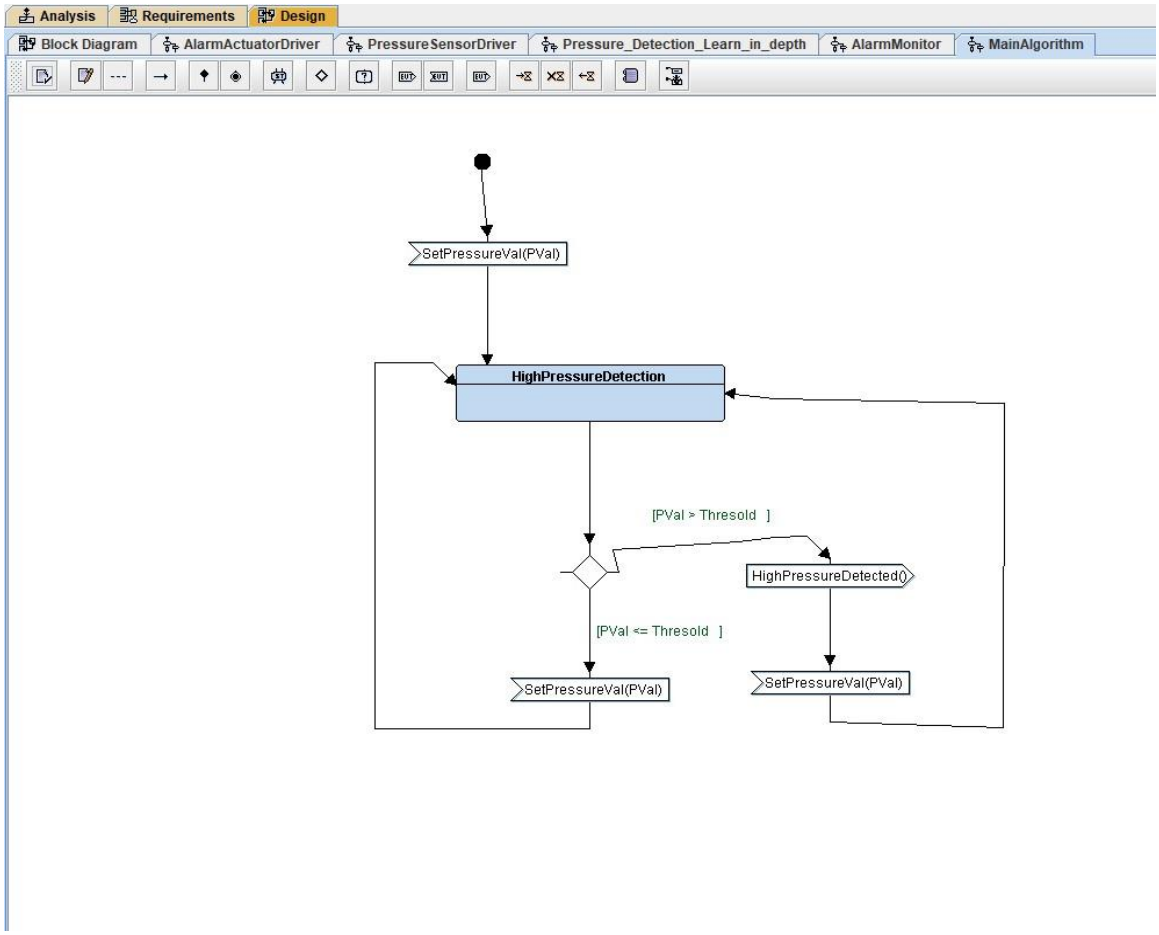


2-State machine for each module in project

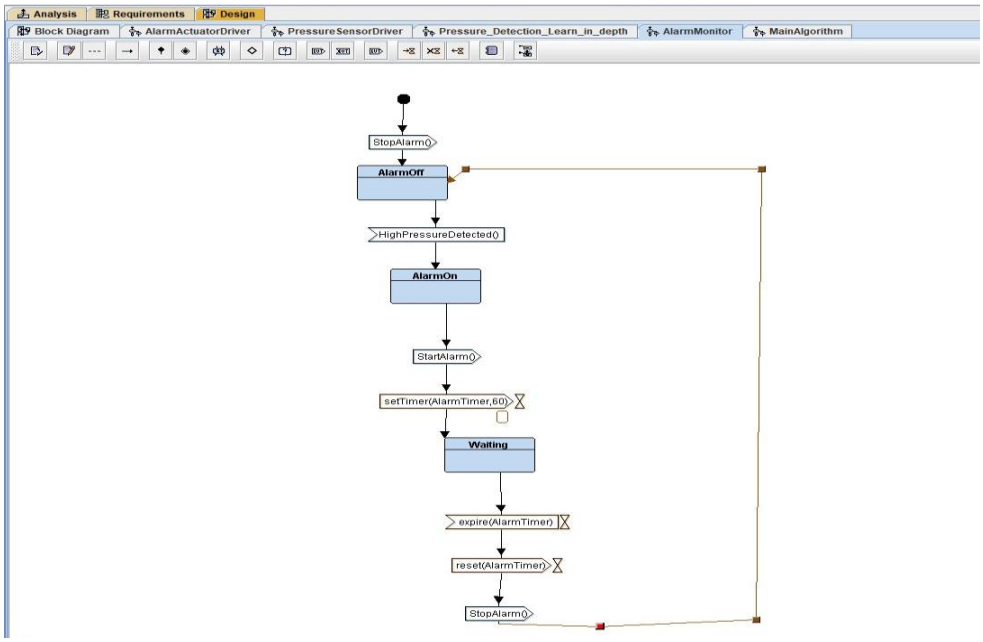
1-Pressure Sensor Driver



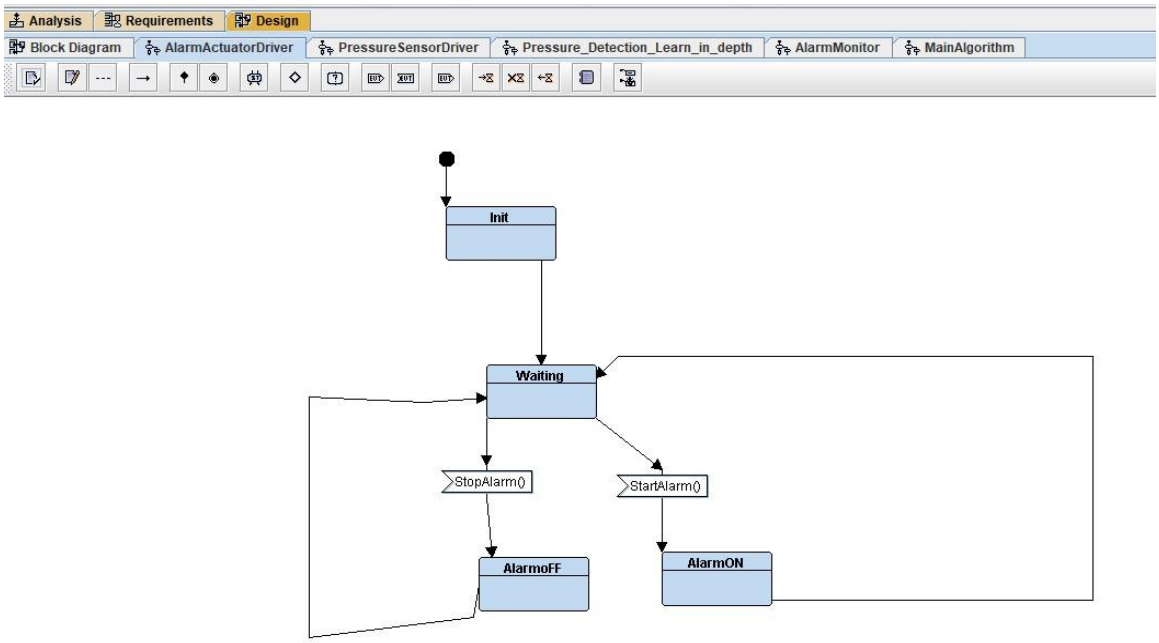
2-MainAlgorithm



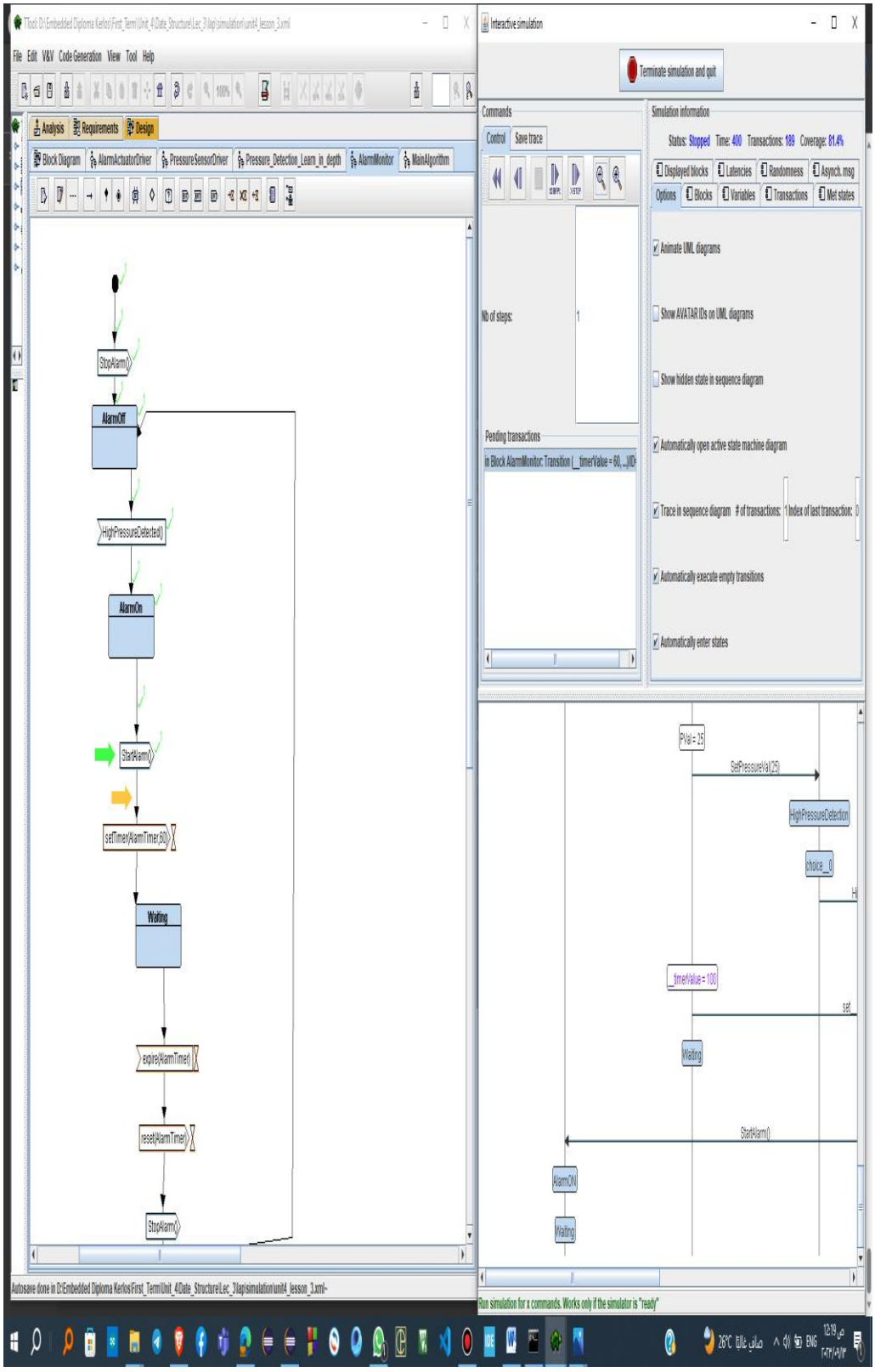
3-AlarmMonitor

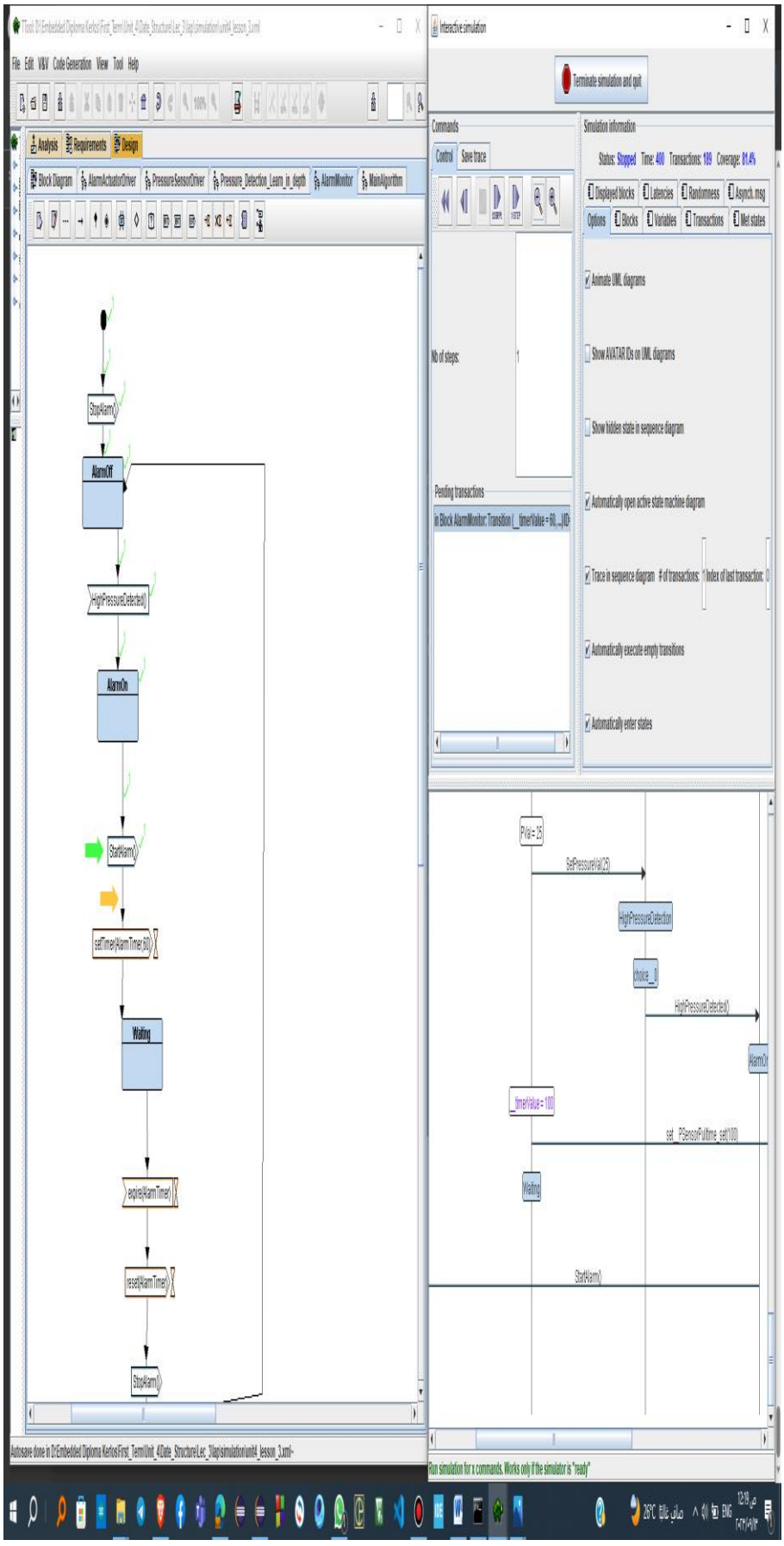


4-AlarmActuatorDriver



Trace


File Edit V&V Code Generation View Tool Help
Analysis
Requirements
Design
Block Diagram
AlarmActuatorDriver
PressureSensorDriver
Pressure_Detection_Learn_in_depth
AlarmMonitor
MainAlgorithm
StopAlarm()
AlarmOff
HighPressureDetected()
AlarmOn
StartAlarm()
setTimer(AlarmTimer,60)
Waiting
expire(AlarmTimer)
reset(AlarmTimer)
StopAlarm()
Interactive simulation
Terminate simulation and quit
Commands
Control
Save trace
Nb of steps:
Pending transactions
Simulation information
Status: Stopped Time: 400 Transactions: 189 Coverage: 81.4%
Displayed blocks
Latencies
Randomness
Asynch. msg
Options
Blocks
Variables
Transactions
Met states
Animate UML diagrams
Show AVATAR IDs on UML diagrams
Show hidden state in sequence diagram
Automatically open active state machine diagram
Trace in sequence diagram # of transactions:
Index of last transaction:
Automatically execute empty transitions
Automatically enter states
P(pi = 25
SetPressure(val25)
HighPressureDetection
choice_0
_timerValue = 100
set
Waiting
StartAlarm()
AlarmON
Waiting
Run simulation for x commands. Works only if the simulator is "ready"


File Edit VAV Code Generation View Tool Help
Analysis
Requirements
Design
Block Diagram
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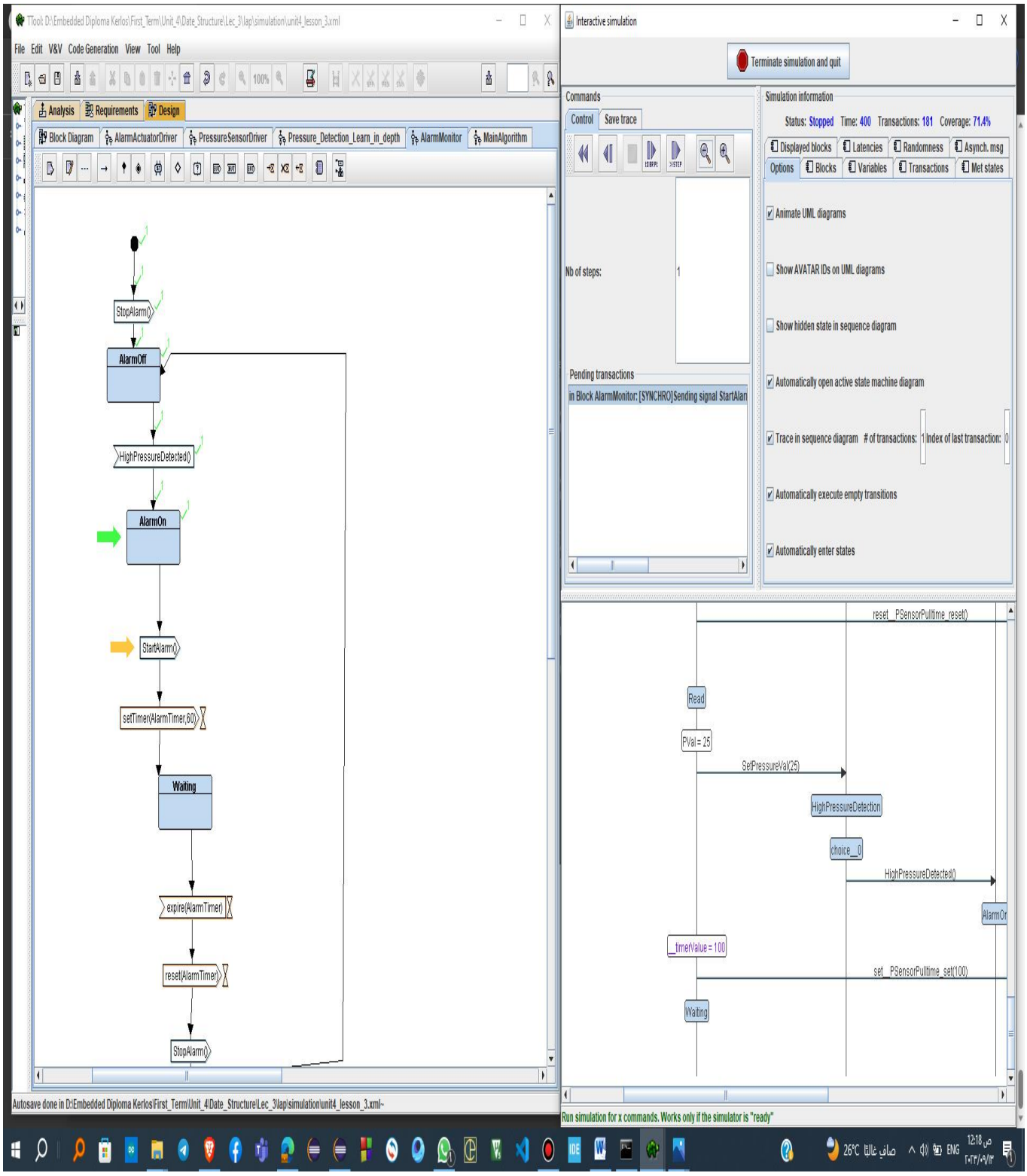
PressureSensorDriver
Pressure_Detection_Learn_in_depth
AlarmMonitor
MainAlgorithm
StopAlarm()
AlarmOff
HighPressureDetected()
AlarmOn
StartAlarm()
setTimer(AlamTimer,60)
Waiting
expire(AlamTimer)
resetAlamTimer()
StopAlarm()
Interactive simulation
Terminate simulation and quit
Commands
Control
Save trace
No of steps:
Pending transactions
Simulation information
Status: Stopped Time: 400 Transactions: 189 Coverage: 91.4%
Displayed blocks
Latencies
Randomness
Asynch. msg
Options
Blocks
Variables
Transactions
Met states
Animate UML diagrams
Show AVATAR IDs on UML diagrams
Show hidden state in sequence diagram
Automatically open active state machine diagram
Trace in sequence diagram
Automatically execute empty transitions
Automatically enter states
P(a) = 15
SetPressureVal(25)
HighPressureDetection
choice = 0
HighPressureDetected()
_timerValue = 100
set_PSensorFullTime_set(100)
Waiting
StartAlarm()
Run simulation for x commands. Works only if the simulator is "ready"


TTool: D:\Embedded Diploma Kerlos\First_Term\Unit_4\Date_Structure\Lec_3\lap\simulation\unit4_lesson_3.xml
File Edit V&V Code Generation View Tool Help
Analysis Requirements Design
Block Diagram AlarmActuatorDriver PressureSensorDriver Pressure_Detection_Learn_in_depth AlarmMonitor MainAlgorithm
StopAlarm()
AlarmOff
HighPressureDetected()
AlarmOn
StartAlarm()
setTimer(AlarmTimer,60)
Waiting
expire(AlarmTimer)
reset(AlarmTimer)
StopAlarm()
Autosave done in D:\Embedded Diploma Kerlos\First_Term\Unit_4\Date_Structure\Lec_3\lap\simulation\unit4_lesson_3.xml~
Interactive simulation
Terminate simulation and quit
Commands
Control Save trace
Nb of steps: 1
Pending transactions
in Block AlarmMonitor: [SYNCHRO]Sending signal StartAlarm
Simulation information
Status: Stopped Time: 400 Transactions: 181 Coverage: 71.4%
Displayed blocks Latencies Randomness Asynch. msg
Options Blocks Variables Transactions Met states
Animate UML diagrams
Show AVATAR IDs on UML diagrams
Show hidden state in sequence diagram
Automatically open active state machine diagram
Trace in sequence diagram # of transactions: 1 Index of last transaction: 0
Automatically execute empty transitions
Automatically enter states
reset_PSensorPulltime_reset()
Read
PVal = 25
SetPressureVal(25)
HighPressureDetection
choice_0
HighPressureDetected()
AlarmOn
timerValue = 100
set_PSensorPulltime_set(100)
Waiting
Run simulation for x commands. Works only if the simulator is "ready"
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ENG
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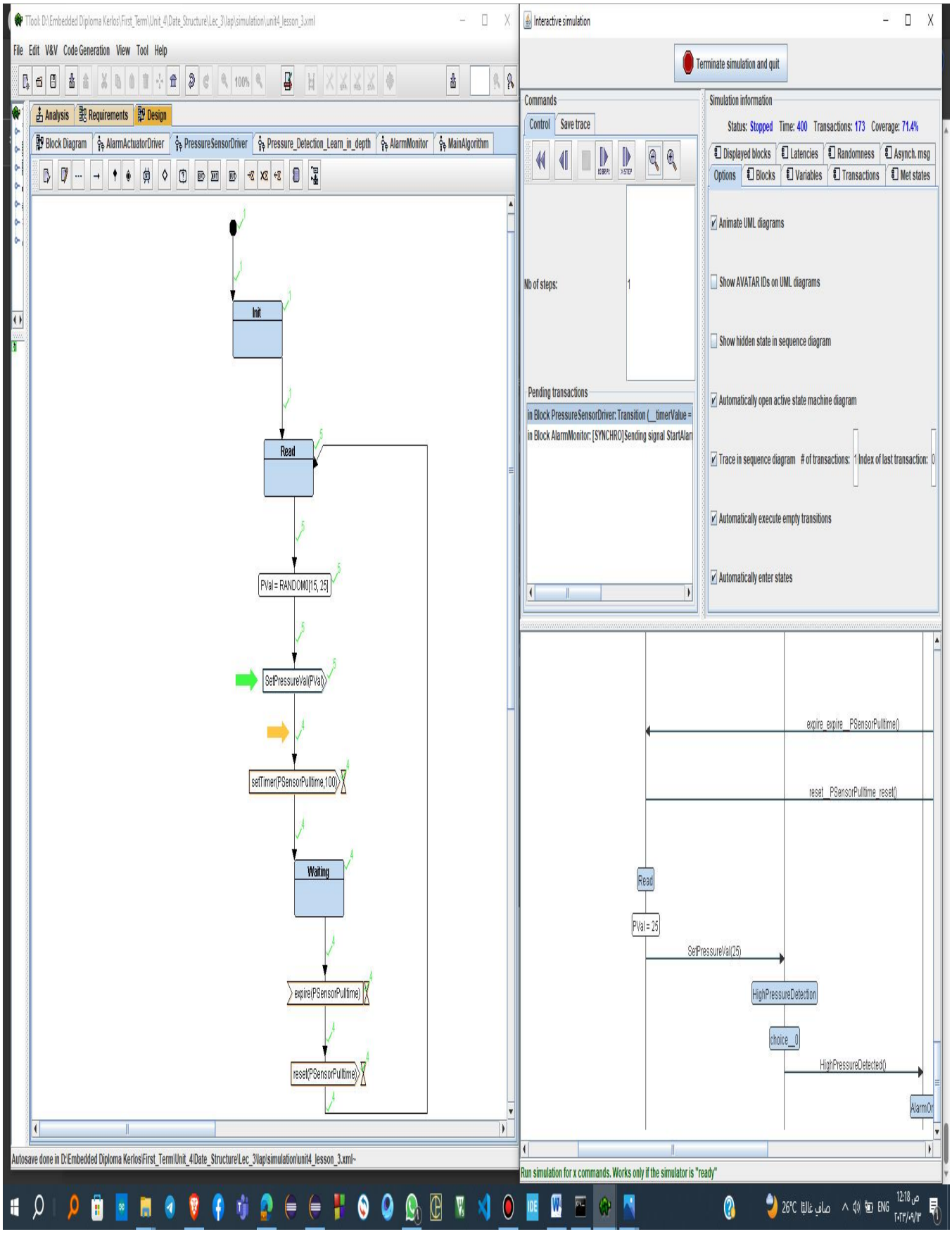
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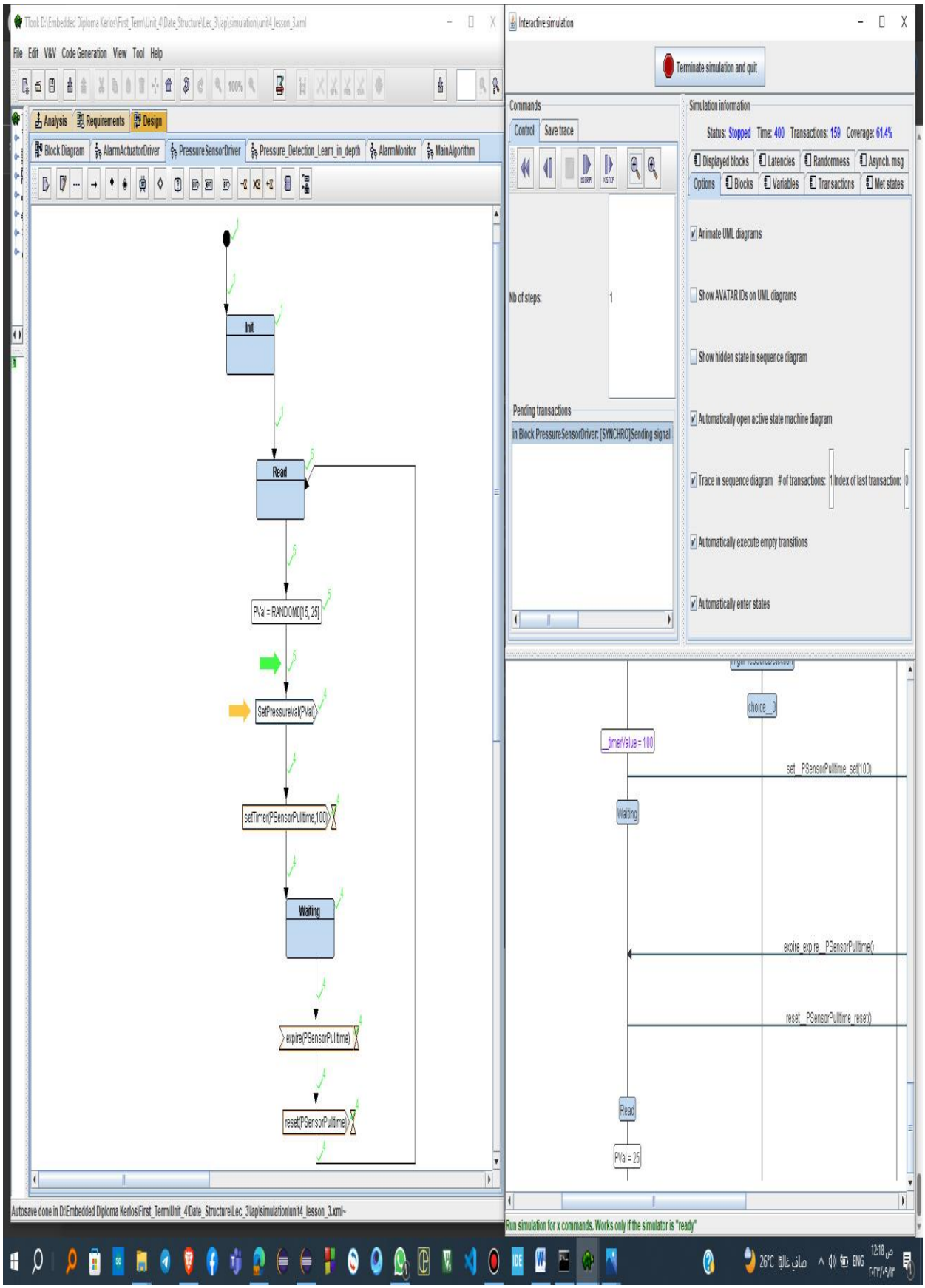
File Edit V&V Code Generation View Tool Help
Analysis Requirements Design
Block Diagram AlarmActuatorDriver PressureSensorDriver Pressure_Detection_Learn_in_depth AlarmMonitor MainAlgorithm
Init
Read
PVal = RANDOM[15, 25]
SetPressureVal(PVal)
setTimer(PSensorPulltime,100)
Waiting
expire(PSensorPulltime)
reset(PSensorPulltime)
Autosave done in D:\Embedded Diploma Kerlos\First_Term\Unit_4\Date_Structure\Lec_3\lap\simulation\unit4_lesson_3.xml~
Interactive simulation
Terminate simulation and quit
Commands
Control Save trace
Nb of steps: 1
Pending transactions
in Block PressureSensorDriver: Transition (__timerValue =
in Block AlarmMonitor: [SYNCHRO]Sending signal StartAlarm
Simulation information
Status: Stopped Time: 400 Transactions: 173 Coverage: 71.4%
Displayed blocks Latencies Randomness Asynch. msg
Options Blocks Variables Transactions Met states
Animate UML diagrams
Show AVATAR IDs on UML diagrams
Show hidden state in sequence diagram
Automatically open active state machine diagram
Trace in sequence diagram # of transactions: 1 Index of last transaction: 0
Automatically execute empty transitions
Automatically enter states
expire_expire__PSensorPulltime()
reset__PSensorPulltime_reset()
Read
PVal = 25
SetPressureVal(25)
HighPressureDetection
choice__0
HighPressureDetected()
Run simulation for x commands. Works only if the simulator is "ready"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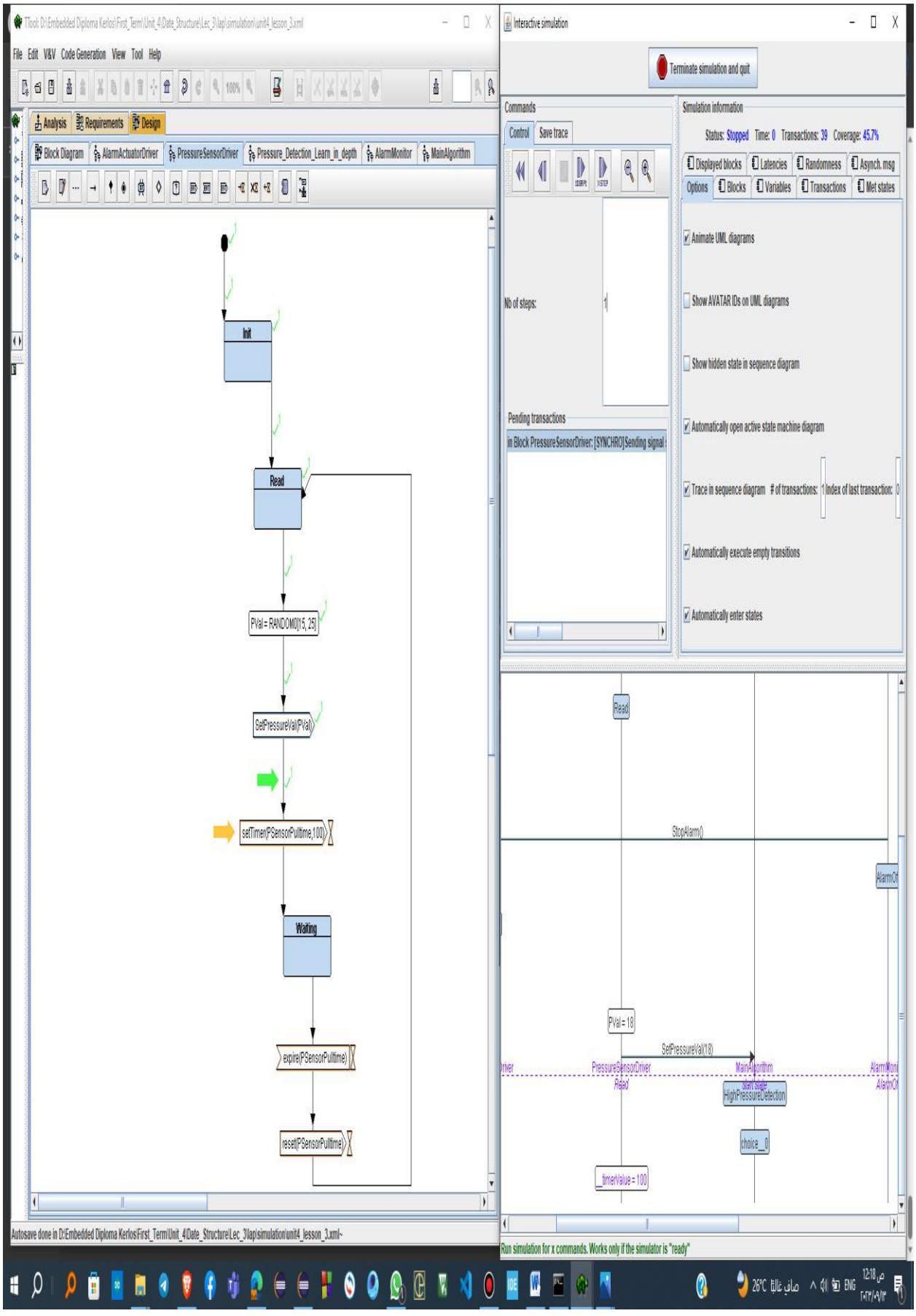
File Edit V&V Code Generation View Tool Help
Analysis Requirements Design
Block Diagram AlarmActuatorDriver PressureSensorDriver Pressure_Detection_Learn_in_depth AlarmMonitor MainAlgorithm
Init
Read
PVal = RANDOM[15, 25]
SetPressureVal(PVal)
setTimer(PSensorPulltime,100)
Waiting
expire(PSensorPulltime)
reset(PSensorPulltime)
Autosave done in D:\Embedded Diploma Kerlos\First_Term\Unit_4\Date_Structure\Lec_3\lap\simulation\unit4_lesson_3.xml~
Interactive simulation
Terminate simulation and quit
Commands
Control Save trace
Nb of steps: 1
Pending transactions
in Block PressureSensorDriver: [SYNCHRO]Sending signal
Simulation information
Status: Stopped Time: 400 Transactions: 159 Coverage: 61.4%
Displayed blocks Latencies Randomness Asynch. msg
Options Blocks Variables Transactions Met states
Animate UML diagrams
Show AVATAR IDs on UML diagrams
Show hidden state in sequence diagram
Automatically open active state machine diagram
Trace in sequence diagram # of transactions: 1 Index of last transaction: 0
Automatically execute empty transitions
Automatically enter states
choice_0
_timer!value = 100
set_PSensorPulltime_set(100)
Waiting
expire_expire_PSensorPulltime()
reset_PSensorPulltime_reset()
Read
PVal = 25
Run simulation for x commands. Works only if the simulator is "ready"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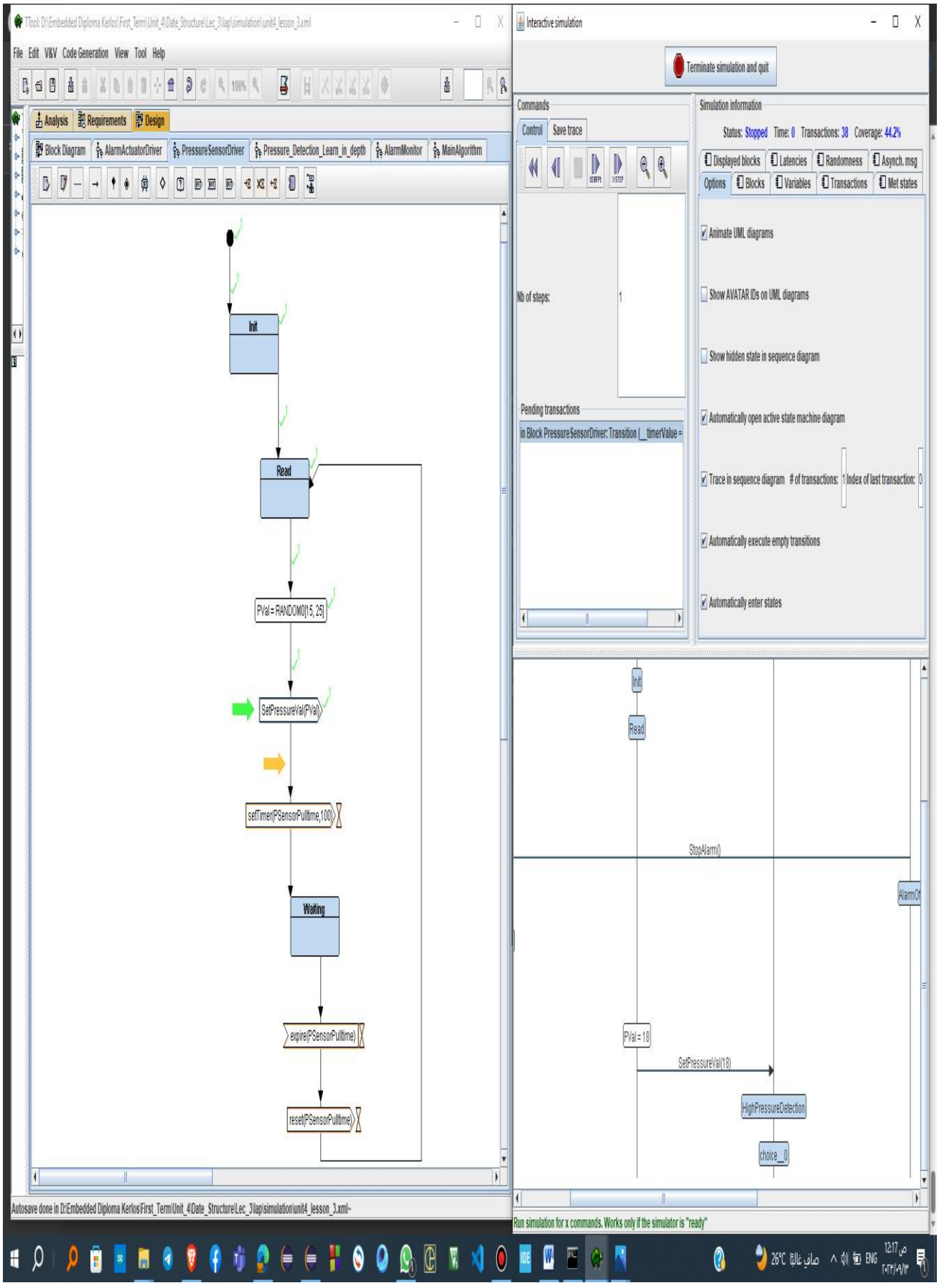
File Edit V&V Code Generation View Tool Help
Analysis Requirements Design
Block Diagram AlarmActuatorDriver PressureSensorDriver Pressure_Detection_Learn_in_depth AlarmMonitor MainAlgorithm
Init
Read
PVal = RANDOM(15, 25)
SetPressureVal(PVal)
setTimer(PSensorPulltime,100)
Waiting
expire(PSensorPulltime)
reset(PSensorPulltime)
Autosave done in D:\Embedded Diploma Kerlos\First_Term\Unit_4\Date_Structure\Lec_3\lap\simulation\unit4_lesson_3.xml~
Interactive simulation
Terminate simulation and quit
Commands
Control
Save trace
Nb of steps:
Pending transactions
in Block PressureSensorDriver: [SYNCHRO]Sending signal
Simulation information
Status: Stopped Time: 0 Transactions: 39 Coverage: 45.7%
Displayed blocks
Latencies
Randomness
Asynch. msg
Options
Blocks
Variables
Transactions
Met states
Animate UML diagrams
Show AVATAR IDs on UML diagrams
Show hidden state in sequence diagram
Automatically open active state machine diagram
Trace in sequence diagram # of transactions: 1 Index of last transaction: 0
Automatically execute empty transitions
Automatically enter states
Read
StopAlarm()
PVal = 18
SetPressureVal(18)
PressureSensorDriver
Read
MainAlgorithm
HighPressureDetection
choice_0
_timerValue = 100
Run simulation for x commands. Works only if the simulator is "ready"


File Edit V&V Code Generation View Tool Help
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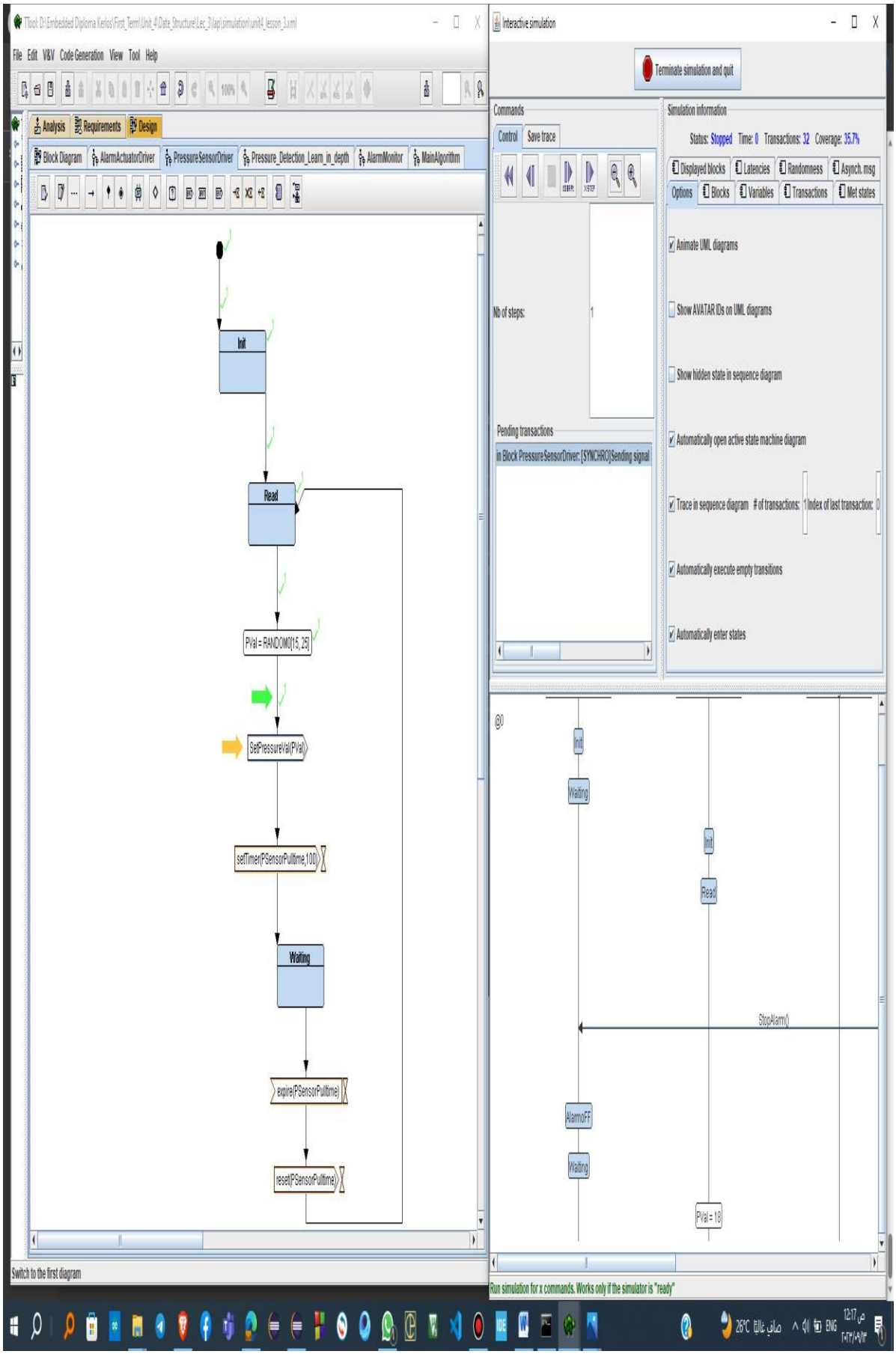
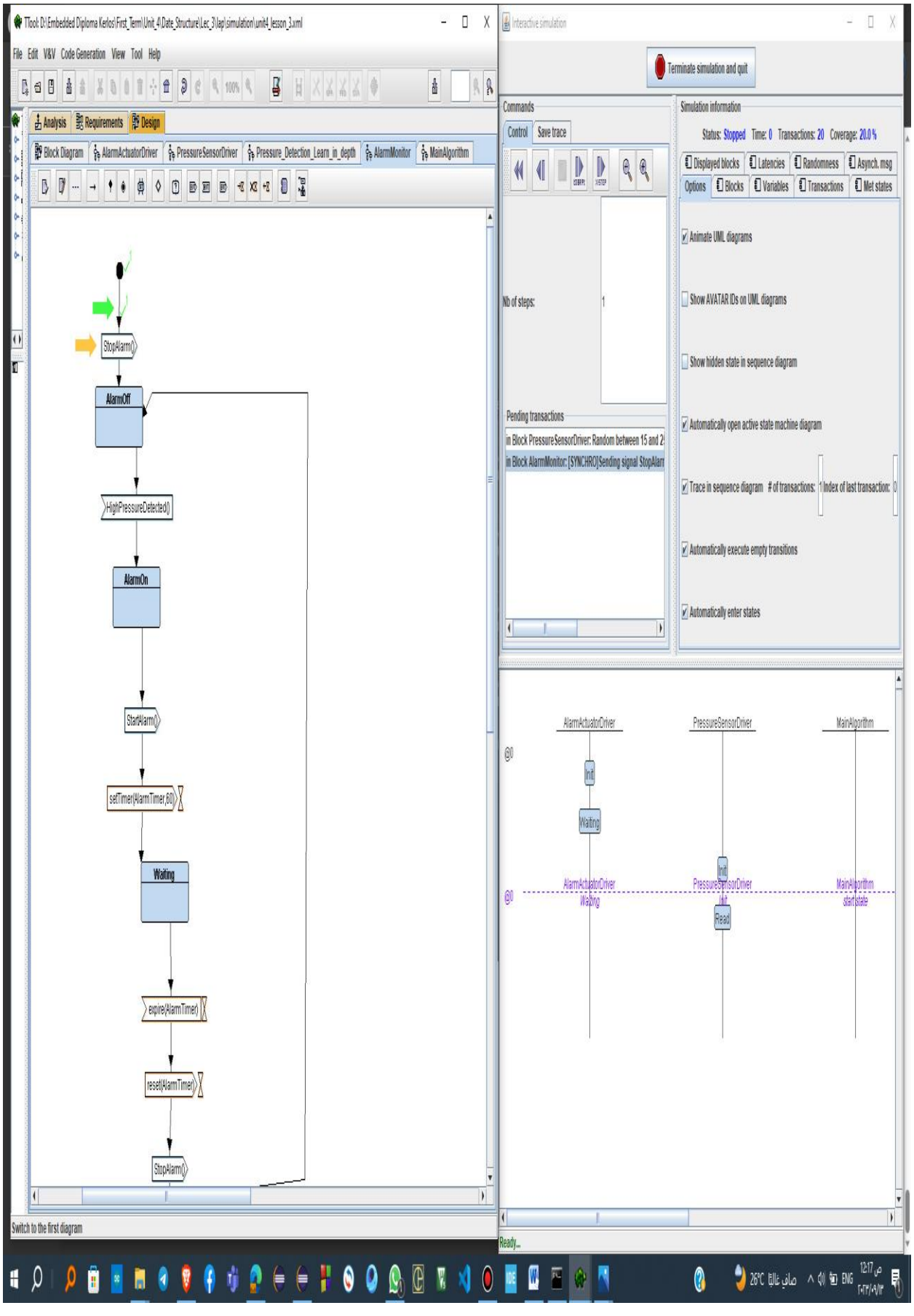
AlarmActuatorDriver
PressureSensorDriver
Pressure_Detection_Learn_in_depth
AlarmMonitor
MainAlgorithm
Init
Read
PVal = RANDOM[15, 25]
SetPressureVal(PVal)
setTimer(PSensorPulltime,100)
Waiting
expire(PSensorPulltime)
reset(PSensorPulltime)
Autosave done in D:\Embedded Diploma Kerlos\First_Term\Unit_4\Date_Structure\Lec_3\lap\simulation\unit4_lesson_3.xml~
Interactive simulation
Terminate simulation and quit
Commands
Control
Save trace
Nb of steps:
1
Pending transactions
in Block PressureSensorDriver: Transition (__timerValue =
Simulation information
Status: Stopped Time: 0 Transactions: 38 Coverage: 44.2%
Displayed blocks
Latencies
Randomness
Asynch. msg
Options
Blocks
Variables
Transactions
Met states
Animate UML diagrams
Show AVATAR IDs on UML diagrams
Show hidden state in sequence diagram
Automatically open active state machine diagram
Trace in sequence diagram # of transactions: 1 Index of last transaction: 0
Automatically execute empty transitions
Automatically enter states
Init
Read
StopAlarm()
AlarmOff
PVal = 18
SetPressureVal(18)
HighPressureDetection
choice__0
Run simulation for x commands. Works only if the simulator is "ready"


TTool: D:\Embedded Diploma Kerlos\First_Term\Unit_4\Date_Structure\Lec_3\lap\simulation\unit4_lesson_3.xml
File Edit V&V Code Generation View Tool Help
Analysis Requirements Design
Block Diagram AlarmActuatorDriver PressureSensorDriver Pressure_Detection_Learn_in_depth AlarmMonitor MainAlgorithm
Init
Read
PVal = RANDOM(15, 25)
SetPressureVal(PVal)
setTimer(PSensorPulltime,100)
Waiting
expire(PSensorPulltime)
reset(PSensorPulltime)
Switch to the first diagram
Interactive simulation
Terminate simulation and quit
Commands
Control Save trace
Nb of steps: 1
Pending transactions
in Block PressureSensorDriver: [SYNCHRO]Sending signal
Simulation information
Status: Stopped Time: 0 Transactions: 32 Coverage: 35.7%
Displayed blocks Latencies Randomness Asynch. msg
Options Blocks Variables Transactions Met states
Animate UML diagrams
Show AVATAR IDs on UML diagrams
Show hidden state in sequence diagram
Automatically open active state machine diagram
Trace in sequence diagram # of transactions: 1 Index of last transaction: 0
Automatically execute empty transitions
Automatically enter states
@0
Init
Waiting
Init
Read
StopAlarm()
AlarmOFF
Waiting
PVal = 18
Run simulation for x commands. Works only if the simulator is "ready"

Init
Read
PVal = RAND(0,5, 25)
SetPressureValP(Val)
setTimerP(PSensorPulltime,100)
Waiting
expireP(PSensorPulltime)
resetP(PSensorPulltime)
Switch to the first diagram
Analysis
Requirements
Design
Block Diagram
AlarmActuatorDriver
PressureSensorDriver
Pressure_Detection_Learn_in_depth
AlarmMonitor
MainAlgorithm
Interactive simulation
Terminate simulation and quit
Commands
Control
Save trace
Simulation information
Options
Blocks
Variables
Transactions
Met states
Animate UML diagrams
Show AVATAR IDs on UML diagrams
Show hidden state in sequence diagram
Automatically open active state machine diagram
Automatically execute empty transitions
Automatically enter states
Pending transactions
Run simulation for x commands. Works only if the simulator is "ready"
AlarmActuatorDriver
PressureSensorDriver
MainAlgorithm
Init
Waiting
Read
StopAlarm()
AlarmOFF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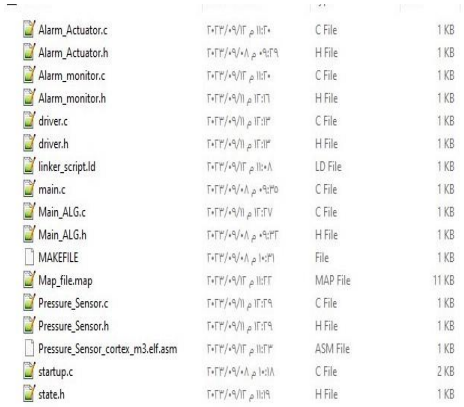
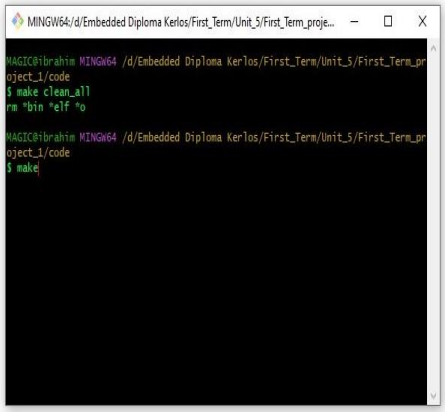
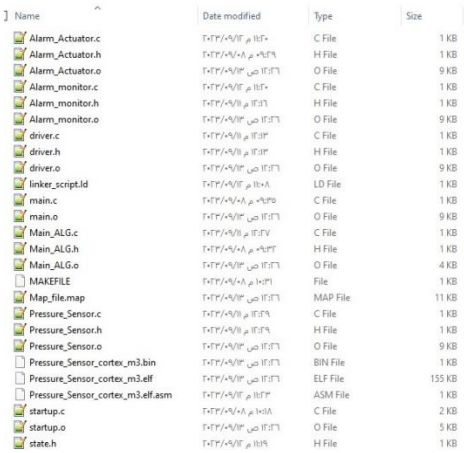
File Edit V&V Code Generation View Tool Help
Analysis Requirements Design
Block Diagram AlarmActuatorDriver PressureSensorDriver Pressure_Detection_Learn_in_depth AlarmMonitor MainAlgorithm
StopAlarm()
AlarmOff
HighPressureDetected()
AlarmOn
StartAlarm()
setTimer(AlarmTimer,60)
Waiting
expire(AlarmTimer)
reset(AlarmTimer)
StopAlarm()
Switch to the first diagram
Interactive simulation
Terminate simulation and quit
Commands
Control Save trace
Nb of steps: 1
Pending transactions
in Block PressureSensorDriver: Random between 15 and 2
in Block AlarmMonitor: [SYNCHRO]Sending signal StopAlarr
Simulation information
Status: Stopped Time: 0 Transactions: 20 Coverage: 20.0 %
Displayed blocks Latencies Randomness Asynch. msg
Options Blocks Variables Transactions Met states
Animate UML diagrams
Show AVATAR IDs on UML diagrams
Show hidden state in sequence diagram
Automatically open active state machine diagram
Trace in sequence diagram # of transactions: 1 Index of last transaction: 0
Automatically execute empty transitions
Automatically enter states
AlarmActuatorDriver
PressureSensorDriver
MainAlgorithm
@0
Init
Waiting
Init
Read
AlarmActuatorDriver
Waiting
PressureSensorDriver
MainAlgorithm
start state
Ready...

Code

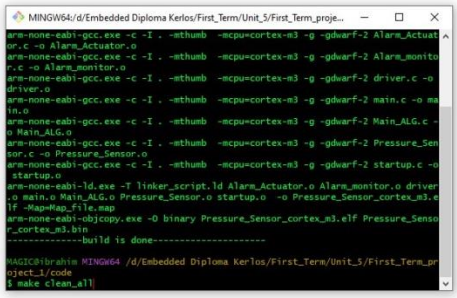


Alarm_Actuator.c	٢٠٢٣/٠٩/١٢ م ١١:٢٠	C File	1 KB
Alarm_Actuator.h	٢٠٢٣/٠٩/٠٨ م ٠٩:٢٩	H File	1 KB
Alarm_monitor.c	٢٠٢٣/٠٩/١٢ م ١١:٢٠	C File	1 KB
Alarm_monitor.h	٢٠٢٣/٠٩/١١ م ١٢:١٦	H File	1 KB
driver.c	٢٠٢٣/٠٩/١١ م ١٢:١٣	C File	1 KB
driver.h	٢٠٢٣/٠٩/١١ م ١٢:١٣	H File	1 KB
linker_script.ld	٢٠٢٣/٠٩/١٢ م ١١:٠٨	LD File	1 KB
main.c	٢٠٢٣/٠٩/٠٨ م ٠٩:٣٥	C File	1 KB
Main_ALG.c	٢٠٢٣/٠٩/١١ م ١٢:٢٧	C File	1 KB
Main_ALG.h	٢٠٢٣/٠٩/٠٨ م ٠٩:٣٣	H File	1 KB
MAKEFILE	٢٠٢٣/٠٩/٠٨ م ١٠:٣١	File	1 KB
Map_file.map	٢٠٢٣/٠٩/١٢ م ١١:٢٢	MAP File	11 KB
Pressure_Sensor.c	٢٠٢٣/٠٩/١١ م ١٢:٢٩	C File	1 KB
Pressure_Sensor.h	٢٠٢٣/٠٩/١١ م ١٢:٢٩	H File	1 KB
Pressure_Sensor_cortex_m3.elf.asm	٢٠٢٣/٠٩/١٢ م ١١:٢٣	ASM File	1 KB
startup.c	٢٠٢٣/٠٩/٠٨ م ١٠:١٨	C File	2 KB
state.h	٢٠٢٣/٠٩/١٢ م ١١:١٩	H File	1 KB

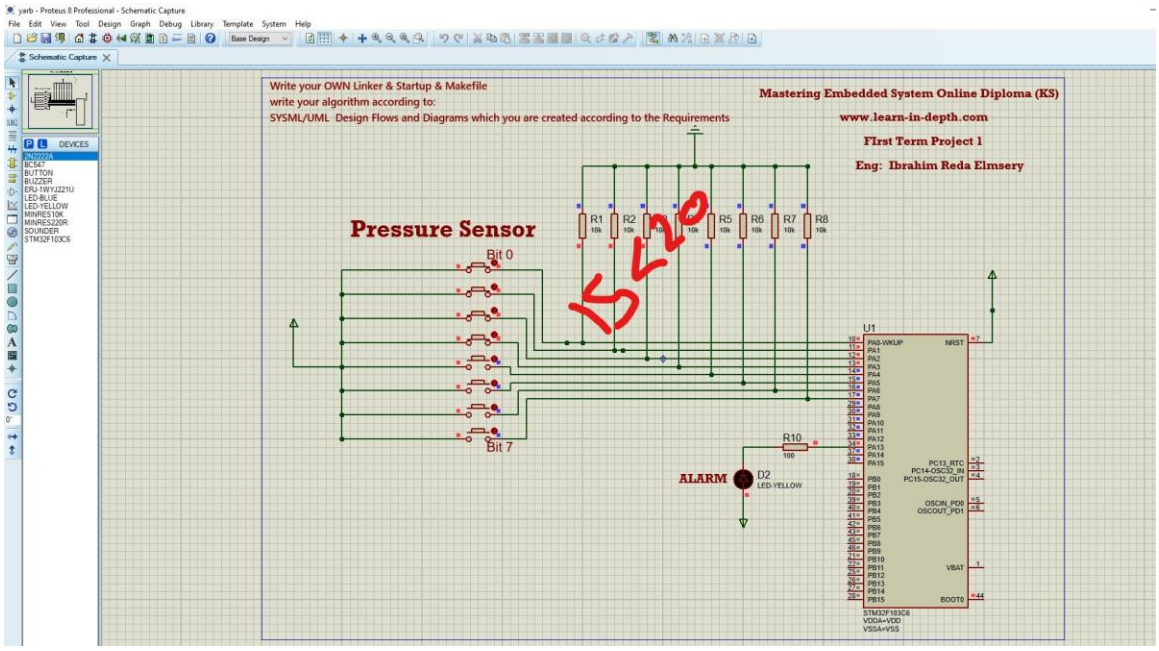


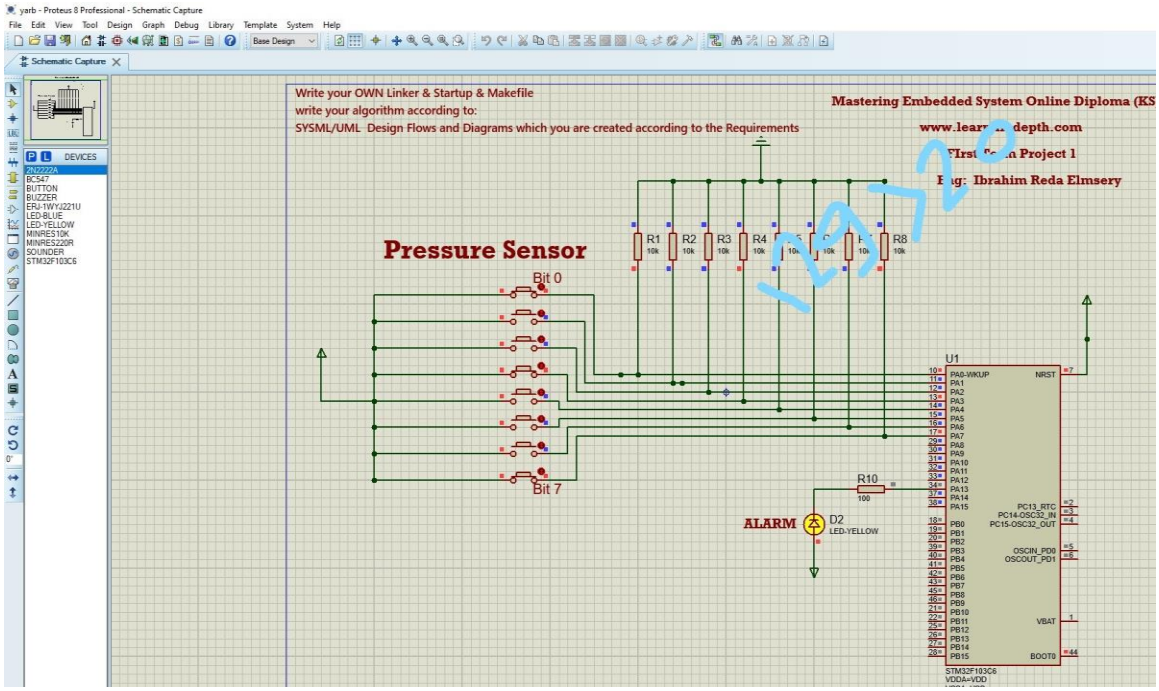


Name	Date modified	Type	Size
Alarm_Actuator.c	٢٠٢٣/٠٩/١٢ م ١١:٢٠	C File	1 KB
Alarm_Actuator.h	٢٠٢٣/٠٩/٠٨ م ٠٩:٢٩	H File	1 KB
Alarm_Actuator.o	٢٠٢٣/٠٩/١٣ ص ١٢:٤٦	O File	9 KB
Alarm_monitor.c	٢٠٢٣/٠٩/١٢ م ١١:٢٠	C File	1 KB
Alarm_monitor.h	٢٠٢٣/٠٩/١١ م ١٢:١٦	H File	1 KB
Alarm_monitor.o	٢٠٢٣/٠٩/١٣ ص ١٢:٤٦	O File	9 KB
driver.c	٢٠٢٣/٠٩/١١ م ١٢:١٣	C File	1 KB
driver.h	٢٠٢٣/٠٩/١١ م ١٢:١٣	H File	1 KB
driver.o	٢٠٢٣/٠٩/١٣ ص ١٢:٤٦	O File	9 KB
linker_script.ld	٢٠٢٣/٠٩/١٢ م ١١:٠٨	LD File	1 KB
main.c	٢٠٢٣/٠٩/٠٨ م ٠٩:٣٥	C File	1 KB
main.o	٢٠٢٣/٠٩/١٣ ص ١٢:٤٦	O File	9 KB
Main_ALG.c	٢٠٢٣/٠٩/١١ م ١٢:٢٧	C File	1 KB
Main_ALG.h	٢٠٢٣/٠٩/٠٨ م ٠٩:٣٣	H File	1 KB
Main_ALG.o	٢٠٢٣/٠٩/١٣ ص ١٢:٤٦	O File	4 KB
MAKEFILE	٢٠٢٣/٠٩/٠٨ م ١٠:٣١	File	1 KB
Map_file.map	٢٠٢٣/٠٩/١٣ ص ١٢:٤٦	MAP File	11 KB
Pressure_Sensor.c	٢٠٢٣/٠٩/١١ م ١٢:٢٩	C File	1 KB
Pressure_Sensor.h	٢٠٢٣/٠٩/١١ م ١٢:٢٩	H File	1 KB
Pressure_Sensor.o	٢٠٢٣/٠٩/١٣ ص ١٢:٤٦	O File	9 KB
Pressure_Sensor_cortex_m3.bin	٢٠٢٣/٠٩/١٣ ص ١٢:٤٦	BIN File	1 KB
Pressure_Sensor_cortex_m3.elf	٢٠٢٣/٠٩/١٣ ص ١٢:٤٦	ELF File	155 KB
Pressure_Sensor_cortex_m3.elf.asm	٢٠٢٣/٠٩/١٢ م ١١:٢٣	ASM File	1 KB
startup.c	٢٠٢٣/٠٩/٠٨ م ١٠:١٨	C File	2 KB
startup.o	٢٠٢٣/٠٩/١٣ ص ١٢:٤٦	O File	5 KB
state.h	٢٠٢٣/٠٩/١٢ م ١١:١٩	H File	1 KB



Simulation


Write your OWN Linker & Startup & Makefile
write your algorithm according to:
SYSML/UML Design Flows and Diagrams which you are created according to the Requirements
Mastering Embedded System Online Diploma (KS)
www.learn-in-depth.com
FIrst Term Project 1
Eng: Ibrahim Reda Elmsery
Pressure Sensor
Bit 0
Bit 7
R1
R2
R3
R5
R6
R7
R8
R10
ALARM
D2
LED-YELLOW
U1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Pressure Sensor
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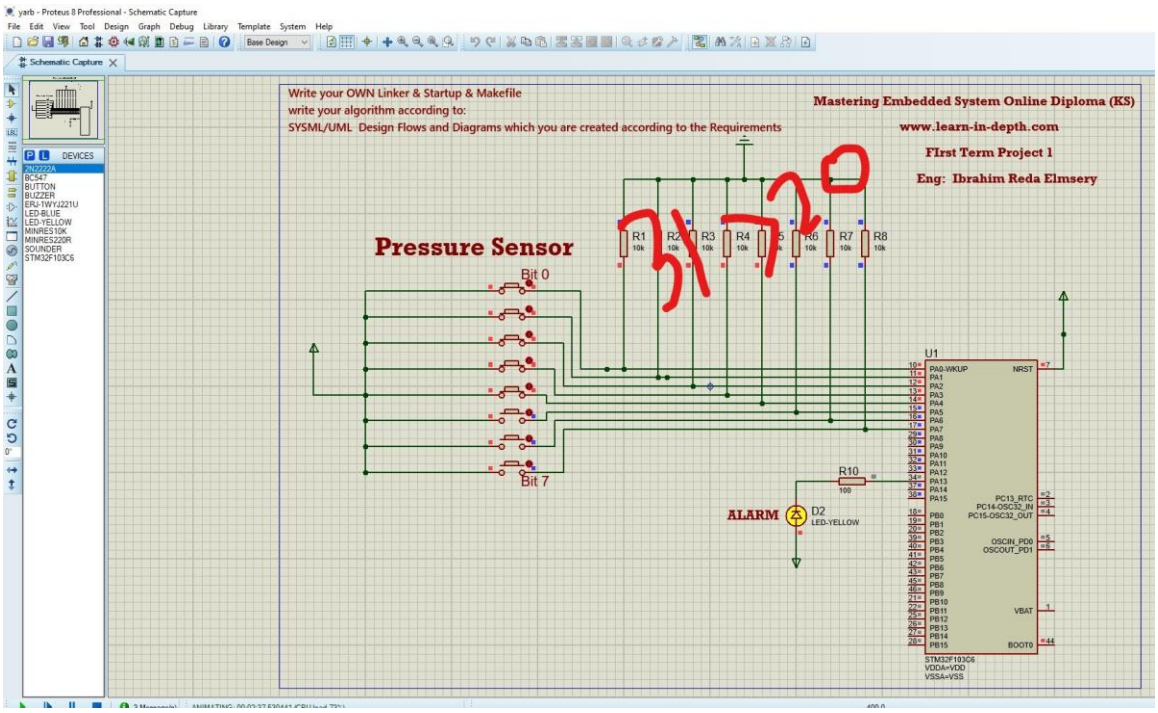
R8
R10
ALARM
D2
LED-YELLOW
U1


yarb - Proteus 8 Professional - Schematic Capture
Schematic Capture
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FIrst Term Project 1
Eng: Ibrahim Reda Elmsery
Pressure Sensor
Bit 0
Bit 7
R1
R2
R3
R4
R6
R7
R8
R10
100
ALARM
D2
LED-YELLOW
U1
PA0-WKUP
NRST
PC13_RTC
PC14-OSC32_IN
PC15-OSC32_OUT
OSCIN_PD0
OSCOUT_PD1
VBAT
BOOT0
STM32F103C6
VDDA=VDD
VSSA=VSS
DEVICES
2N2222A
BC547
BUTTON
BUZZER
ERJ-1WYJ221U
LED-BLUE
LED-YELLOW
MINRES10K
MINRES220R
SOUNDER
STM32F103C6