**Eastern Mediterranean University - Computer Engineering Department**

**Software Engineering Program**

**CMSE-201 Fundamentals of Software Engineering – Final Exam**

**Instructor: Assoc. Prof. Dr. Alexander G. Chefranov**

**Student ID\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Duration: 150 Minutes January 5, 2019**

**You may have seven A4 sheets with your handwritings for your help. Copies (handwritten, photo, printouts, etc.) are not allowed. Electronic devices are not allowed. Material exchange is not allowed.**

**Totally: 7 questions, 100 points, and 10 pages.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  | **Total** |
| **Before MT Exam questions** | **After MT Exam questions** |  |
| **11** | **11** | **11** | **17** | **17** | **17** | **16** | **100** |
|  |  |  |  |  |  |  |  |

**Q1) (11 points).** Explain why programs that are developed using evolutionary development are likely to be difficult to maintain.

Programs developed using evolutionary process model may be difficult maintaining because

* the programs are often poorly structured causing unexpected side-effects when the programs are changed
* the programs developed with many prototypes are often poorly documented, and, hence, there is not enough information to understand the code for its effective changing

**Q2) (11 points).** An automated ticket issuing system sells rail tickets. Users select their destination and input a credit card and a personal identification number. The rail ticket is issued and their credit card account charged. When the user presses the start button, a menu display of potential destinations is activated, along with a message to the user to select a destination. Once a destination has been selected, users are requested to input their credit card. Its validity is checked and the user is then requested to input a personal identifier. When the credit transaction has been validated, the ticket is issued. Draw a sequence diagram showing the actions performed in the ticket issuing system. You may make any reasonable assumptions about the system. Pay attention to specifying user errors.

Tıcket

Transaction OK

Begin transaction

PIN valid

<<Exception invalid PIN>>

<<Exception invalid PIN>>

PIN

Enter PIN

Credit card OK

<<exception>> invalid card

<<exception>> invalid card

Check Credit card

Credit card

Your credıt card?

Selected destination

Select destination, pls

Menu dısplayed

Start button pressed

User

Systemm

Bank

User

Systemm

Bank

Continued

PIN

**Q3) (11 points).** Draw state machine model of the control software for a telephone answering system that records incoming messages and displays the number of accepted messages on an LED. The system should allow the telephone customer to dial in typing a sequence of numbers and play the recorded messages

finished

play

finished

Recording requested

busy

dial

dial

finished

accepted

number

**Q4) (17 points).** Identify UML object diagram for a petrol gas station where drivers swipe their credit card through a reader connected to the pump. The card is verified by communication with a credit company computer, and a fuel limit is established. The driver may then take the fuel required. When fuel delivery is complete and the pump hose is returned to its holster, the driver’s credit card account is debited with the cost of the fuel taken. The credit card is returned after debiting. If the card is invalid, the pump returns before fuel is dispensed.

Petrol gas station

PGS ID

Set()

Run()

Report()

Card reader

CR ID

Card#

CardAmount

Set()

Run()

Report()

Read&VerifyCard()

GetCard#()

GetCardAmount()

ReturnCard()

Pump

P ID

DispenseAmount

State: (Idle, Working, Finished)

Set()

Run()

Report()

Deliver()

GetDispenseAmount()

SetDispenseAmount()

Accounting

A ID

Set()

Run()

Report()

DispenseFuel&Debit(Pump, Amount, Card#)

**Q5) (17 points).**

Project tasks are as follows:

|  |  |  |
| --- | --- | --- |
| Task | Duration | Dependencies |
| T1 | 3 |  |
| T2 | 11 | ~~T2 (M1)~~ |
| T3 | 6 | T2 (M1) |
| T4 | 8 |  |
| T5 | 4 | T1 (M2) |
| T6 | 8 | T1, T3 (M3) |
| T7 | 3 | T2 (M1) |
| T8 | 12 | T5, T6 (M4) |
| T9 | 9 | T7, T8 (M5) |
| T10 | 5 | T9 (M6) |
| T11 | 5 | T2(M1) |

 Draw the activity network diagram with start date 7.01.2019 using the calendar below. Define the critical path in it (enlist the tasks lying on the critical path). Draw a Gantt chart showing distribution of the tasks T1-T11~~0~~ between three programmers, Mark, Donald, and Dilek. Give explanations.

**Calendar for Year 2019 (Turkey)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| [January](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=1&country=4) |  | [February](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=2&country=4) |  | [March](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=3&country=4) |
|

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
|   | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 |   |   |   |

 |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
|   |   |   |   | 1 | 2 | 3 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 |   |   |   |

 |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
|   |   |   |   | 1 | 2 | 3 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 |

 |
| 6: 14: 21: 28: |  | 5: 13: 19: 26: |  | 6: 14: 21: 28: |
|  |
| [April](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=4&country=4) |  | [May](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=5&country=4) |  | [June](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=6&country=4) |
|

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 |   |   |   |   |   |

 |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
|   |   | 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | 31 |   |   |

 |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
|   |   |   |   |   | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |

 |
| 5: 12: 19: 27: |  | 5: 12: 19: 26: |  | 3: 10: 17: 25: |
|  |
| [July](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=7&country=4) |  | [August](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=8&country=4) |  | [September](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=9&country=4) |
|

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 |   |   |   |   |
|   |   |   |   |   |   |   |

 |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
|   |   |   | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 |   |
|   |   |   |   |   |   |   |

 |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
|   |   |   |   |   |   | 1 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 |   |   |   |   |   |   |

 |
| 2: 9: 17: 25: |  | 1: 7: 15: 23: 30: |  | 6: 14: 22: 28: |
|  |
| [October](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=10&country=4) |  | [November](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=11&country=4) |  | [December](https://www.timeanddate.com/calendar/monthly.html?year=2019&month=12&country=4) |
|

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
|   | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 |   |   |   |
|   |   |   |   |   |   |   |

 |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
|   |   |   |   | 1 | 2 | 3 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 |   |
|   |   |   |   |   |   |   |

 |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mo | Tu | We | Th | Fr | Sa | Su |
|   |   |   |   |   |   | 1 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | 31 |   |   |   |   |   |

 |
| 5: 14: 21: 28: |  | 4: 12: 20: 26: |  | 4: 12: 19: 26: |

| Holidays and Observances: |
| --- |
|

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |
| --- | --- |
| 1 Jan | [New Year's Day](https://www.timeanddate.com/holidays/turkey/new-year-day) |
| 23 Apr | [National Sovereignty and Children's Day](https://www.timeanddate.com/holidays/turkey/national-sovereignty-children-day) |
| 1 May | [Labor and Solidarity Day](https://www.timeanddate.com/holidays/turkey/labor-and-solidarity-day) |
| 19 May | [Commemoration of Atatürk, Youth and Sports Day](https://www.timeanddate.com/holidays/turkey/ataturk-youth-sport-day) |
| 3 Jun | [Ramadan Feast Eve](https://www.timeanddate.com/holidays/turkey/ramadan-feast-eve) |
| 4 Jun | [Ramadan Feast](https://www.timeanddate.com/holidays/turkey/ramadan-feast) |
| 5 Jun | [Ramadan Feast Day 2](https://www.timeanddate.com/holidays/turkey/ramadan-feast-day-2) |
| 6 Jun | [Ramadan Feast Day 3](https://www.timeanddate.com/holidays/turkey/ramadan-feast-day-3) |
| 15 Jul | [Democracy and National Unity Day](https://www.timeanddate.com/holidays/turkey/democracy-and-national-unity-day) |
| 10 Aug | [Sacrifice Feast Eve](https://www.timeanddate.com/holidays/turkey/sacrifice-feast-eve) |

 |   |   |

|  |  |
| --- | --- |
| 11 Aug | [Sacrifice Feast](https://www.timeanddate.com/holidays/turkey/sacrifice-feast) |
| 12 Aug | [Sacrifice Feast Day 2](https://www.timeanddate.com/holidays/turkey/sacrifice-feast-day-2) |
| 13 Aug | [Sacrifice Feast Day 3](https://www.timeanddate.com/holidays/turkey/sacrifice-feast-day-3) |
| 14 Aug | [Sacrifice Feast Day 4](https://www.timeanddate.com/holidays/turkey/sacrifice-feast-day-4) |
| 30 Aug | [Victory Day](https://www.timeanddate.com/holidays/turkey/victory-day) |
| 28 Oct | [Republic Day Eve](https://www.timeanddate.com/holidays/turkey/republic-day-eve) |
| 29 Oct | [Republic Day](https://www.timeanddate.com/holidays/turkey/republic-day) |
| 10 Nov | [Ataturk Memorial Day](https://www.timeanddate.com/holidays/turkey/day-of-mourning-for-ataturk) |
| 31 Dec | [New Year's Eve](https://www.timeanddate.com/holidays/turkey/new-year-eve) |

 |

 |

Critical path=(T2 (11), T3(6), T6(8), T8(12), T9(9), T10(5)); Critical path length=11+6+8+12+9+5=51 days

07.01.19

T1

3

T2

11

T4

8

T5

4

10.01.19

22.01.19

T3

6

30.01.19

T7

3

T6

8

11.02.19

T8

12

27.02.19

T9

9

T11

5

12.03.19

T10

5

19.03.19

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 07.01. |  |  |  |  |  |  | 14.01 |  |  |  |  |  |  | 21.01 |  |  |  |  |  |  |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Mark | T1 | T5 |  |  | T5 |  |  |  |  |  |  | T11 |  |  |
| Donald | T2 |  |  | T2 |  |  | T2 | T3 |  |  |
| Dilek | T4 |  |  | T4 |  |  |  |  |  | T7 |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 28.01 |  |  |  |  |  |  | 04.02 |  |  |  |  |  |  | 11.02 |  |  |  |  |  |  |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Mark | T11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Donald | T3 | T6 |  |  | T6 |  |  | T8 |  |  |
| Dilek |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 18.02 |  |  |  |  |  |  | 25.02 |  |  |  |  |  |  | 04.03 |  |  |  |  |  |  |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Mark |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Donald | T8 |  |  | T8 | T9 |  |  | T9 |  |  |
| Dilek |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 11.03 |  |  |  |  |  |  | 18.03 | 19.03 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Mark |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Donald | T9 | T10 |  |  | T10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dilek |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Q6) (17 points)** A system has 10 external inputs, 8 external inquiries (average complexity), 5 external outputs (simple), 6 internal logical files (complex), and 4 interfaces with external legacy systems (average). Compute Unadjusted Function Point Count. Explain your calculations.

Hint:

****

UFC=ExternaInputs\*4+ExternalInquiries\*4+ExternalOutputs\*4+InternalLogicalFiles\*15+ExternalInterfaces\*7= 10\*4+8\*4+5\*4+6\*15+4\*7=40+32+20+90+28=210 FP

**Q7) (16 points)** Design two test cases to test the states of the micro-wave whose state model is defined in Lecture notes:



Test-case 1: Original state – Waiting; Stimulus – Full power; Expected state – Full power

Test-case 2: Original state – Operation; Stimulus – Door open; Expected state – Disabled