Number: _____ Name: _____

FCT/UNL Mestrado Integrado em Engenharia Informática

Software Development Methods, 2019/2020

Test A

2nd Test **14 of December, 2019**

[EN] Attention:
This test has a maximum duration of **120 minutes**.

Please do not unstable this group of pages. This test is entirely composed by **multiple choice** questions, to be answered in the Bubble sheet (given separately). To discourage lottery answering, wrong answers will lead to a discount of ¼ of the grade of the corresponding questions in the final grade.

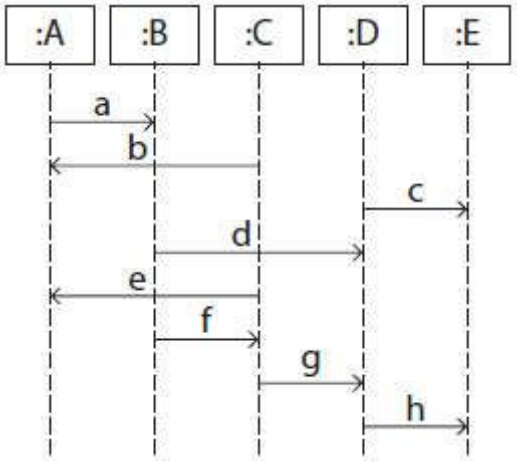
To interpret the questions is also part of the evaluation. At the end of the test, you have to give back this test pages and the bubble sheet. **Please ensure that this page is correctly identified.**

When answering in the bubble sheet, you can first use a pencil. This way you can correct if you make some mistake. Before finishing you have to write with a pen.

Please read carefully before answering. Good Luck!

Part 1 – Sequence Diagrams – Answer in the bubble sheet!

1. (0.5) Consider the following sequence diagram. It is imperative that `b` is sent immediately after `a`. Is this guaranteed by this model, or is there something we need to fix? If there is something to fix, what do we need to do? Choose the **correct** answer.



   A. We don't have to change anything, the model already guarantees that `b` is sent immediately after `a`.
   B. Put `d` and `f` inside a `critical` fragment.
   C. Put `a` and `b` inside a `critical` fragment.
   D. Put `a` and `b` inside a `strict` fragment.
   E. Put `a` and `b` sharing a lifeline.

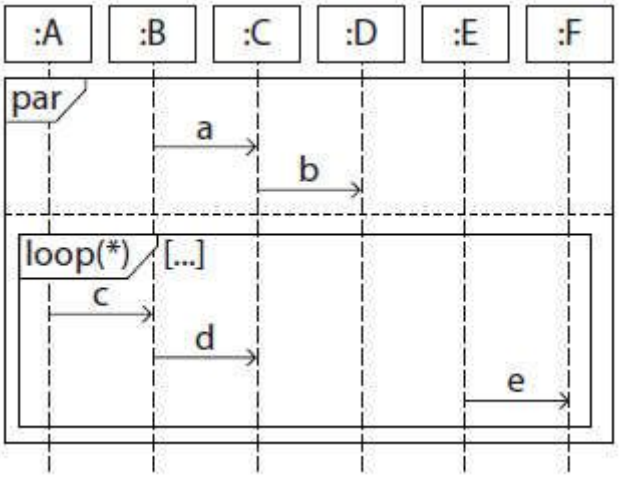
2. (0.5) Consider again the diagram in the previous question. Suppose you have to send `d` and `f` exactly 42 times. How would you do it? Choose the **correct** answer.

   A. loop
   B. loop (42, 42)
   C. loop (1, 42)
   D. loop (1..42)
   E. loop(42)

3. (0.5) Still according to the same diagram, which traces are **impossible**? **There may be more than one.**

   A. a → b → d → c → e → f → g → h
   B. a → b → c → e → d → f → g → h
   C. a → b → c → d → e → f → g → h
   D. a → b → c → d → e → f → h → g
   E. c → a → d → b → e → f → g → h

4. (0.5) Consider the following sequence diagram. Which execution traces are **possible**? **There may be more than one.**



   A. b → a
   B. c → a → b → d → e
   C. a → b → c → d → e → a → b
   D. c → d → e → a → b

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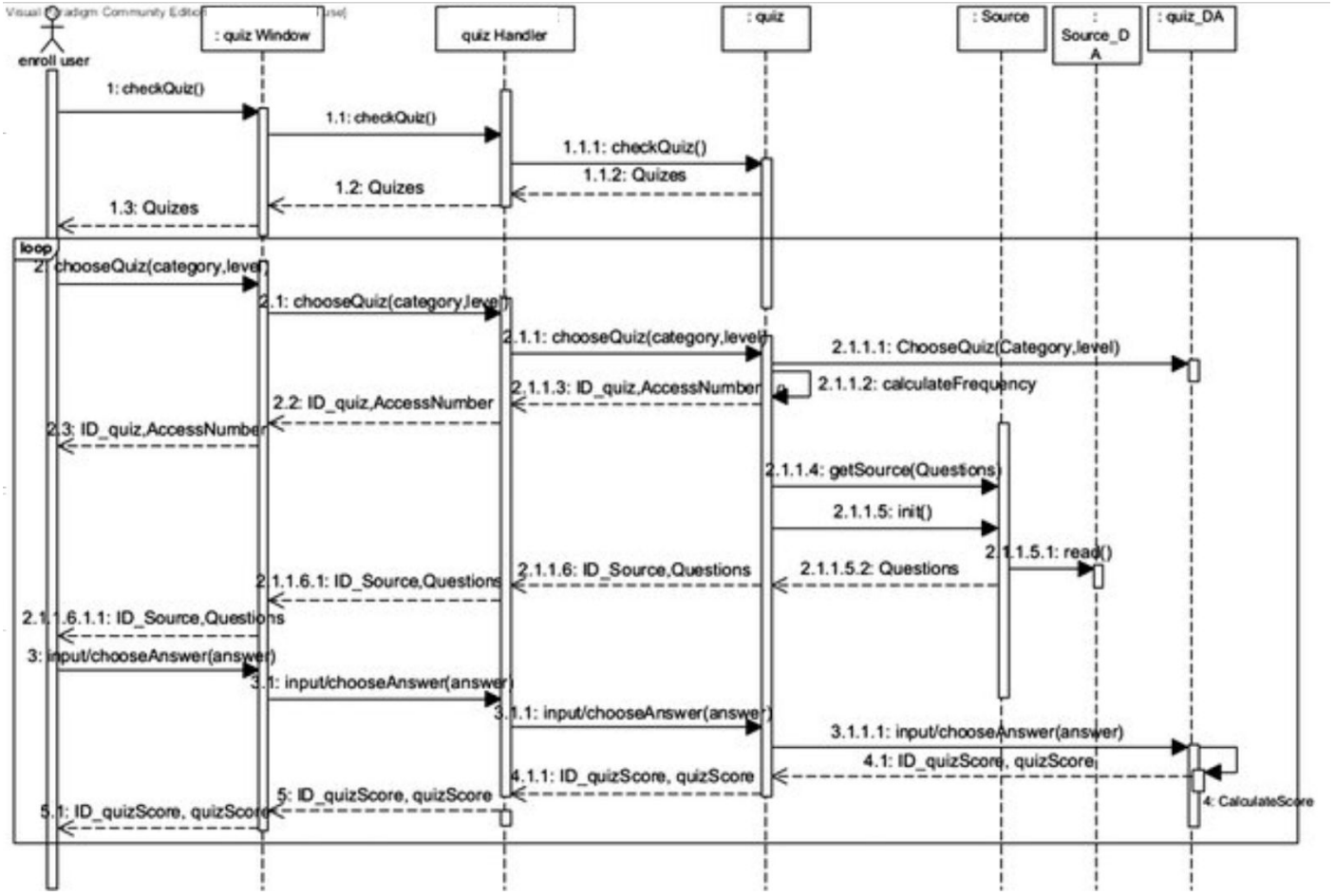
5. (1) Which statement is **true** regarding the following sequence diagram?



A. **quiz Handler** can be represented by symbol:

B. **Source_DA** can be represented by symbol:

C. **quiz** can be represented by symbol:

D. **quiz Window** can be represented by symbol:

E. **Source** can be represented by symbol:

6. (0.5) Consider again the diagram in the previous question. Which of the following statements is **true**:

A. The methods supported by **quiz** are: `ChooseQuiz(category,level)`, `getSource(Questions)`, `init()`, `init/chooseAnswer(answer)`.
B. The methods supported by **Source** are: `read()`, `getSource(Questions)`.
C. The methods supported by **quiz_DA** are: `CalculateScore`, `input/chooseAnswer(answer)`.
D. The methods supported by **Source** are: `Questions`.
E. None of the above.

7. (0.5) Still according to the same diagram, which of the following statements can we infer from it that is **true**:

    A. According to the diagram, **quiz Window** in the Class Diagram is a class that can call methods from **Source**.
    B. According to the diagram, **Source** in the Class Diagram is a class that can call methods from enroll **quiz**.
    C. **Enroll user** is a class in the Class Diagram that calls methods from **quiz Window**.
    D. According to the diagram, **Source** does not know about **quiz**.
    E. According to the diagram, **Source** and **quiz_DA** know about each other.

Part 2 – Design Class Diagrams – Answer in the bubble sheet!

8. (0.5) Which if the following sentences is **false**?

    A. Aggregation is symmetric – an object can be part of itself.
    B. Aggregation is transitive.
    C. Association is symmetric **–** an object can be associated to itself.
    D. In Aggregation, if you only have navigability from the whole to the part, the part is not even aware that it is part of the whole.
    E. The aggregate uses services of its parts.

9. (0.5) Which if the following sentences is **false**?

    A. Like aggregation, composition is a whole-part relationship, transitive and asymmetric.
    B. Unlike aggregation, in composition the parts have no independent life outside of the whole.
    C. In composition, each part belongs to at most one and only one whole.
    D. If you destroy the whole object, you also destroy all its parts, and the reverse.
    E. The composite has sole responsibility for the disposition of all its parts **–** this means responsibility for their creation and destruction.

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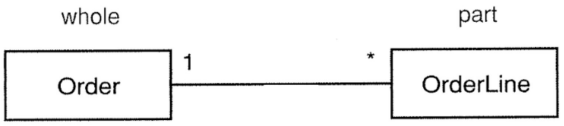
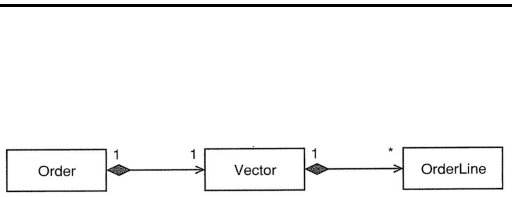
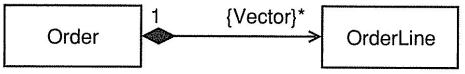
10. (0.5) Consider the following fragment of a domain class diagram:



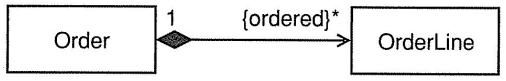
Which of the following patterns is an **incorrect** mapping to design class diagram?



A.



B.

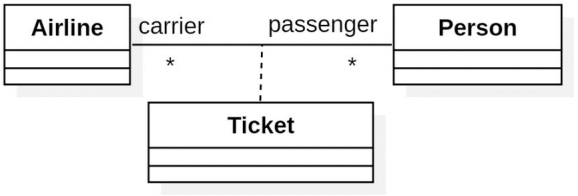


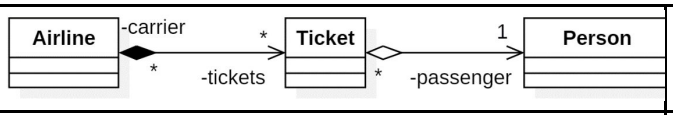
C.

None of the patterns before

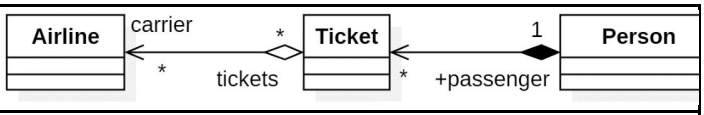
D.

11. (0.5) How shall we refine the following class diagram? Choose the **best** option.

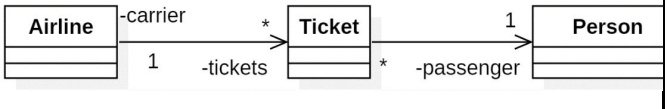




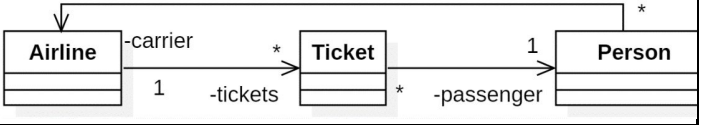
A.



B.



C.



D.

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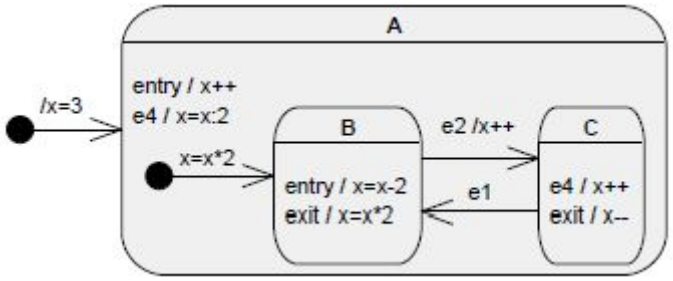
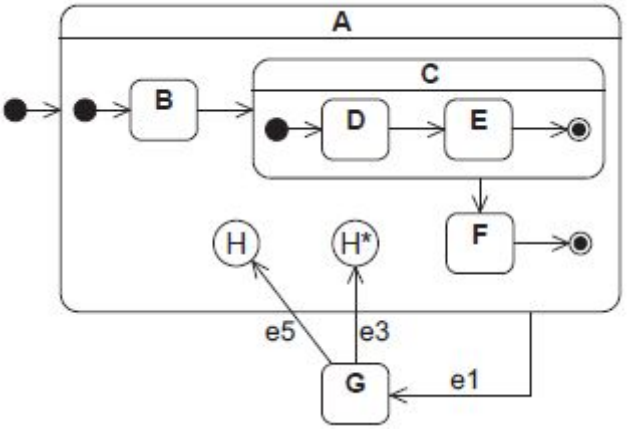
Part 3 – Statecharts – Answer in the bubble sheet!

12. (2) Consider the following state machine. Which is the value of x after the events `e2 e4 e4 e1 e4 e2`? Choose the **correct** answer.



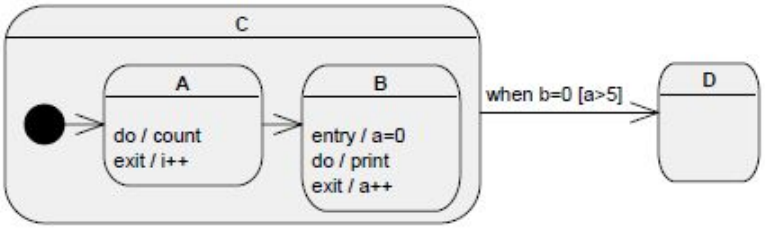
A. 6
B. 12
C. 13
D. 15

13. (0.5) Consider the following state machine. Which of the following statements is **true**?



A. It is possible that states C and F are active at the same time.
B. Assuming that E is an active state and that event `e1` occurs, G becomes the next active state. If `e3` occurs, then C, and more precisely D, becomes the next active state.
C. In the beginning, B is an active state.
D. Assuming that H is an active state and that event e5 occurs, then B becomes the next active state, independently on which state was active before.

14. (2) Consider the following state machine. When does a transaction to the state D occurs? Choose the **correct** answer.



A. As soon as all the effects of states A and B are concluded.
B. As soon as the event `a > 5` occurs and the guard is evaluated as `true`.
C. As soon as all the effects of state B are concluded.
D. As soon as b=0 and a exceed the value 5.

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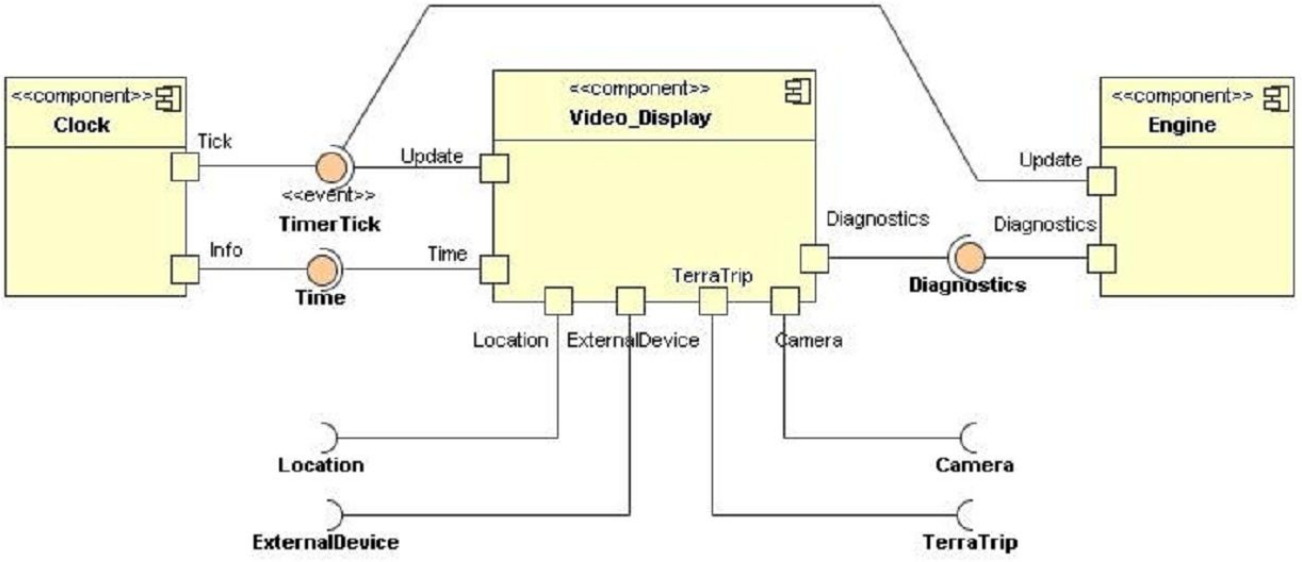
Part 4 – Components Diagrams – Answer in the bubble sheet!

15. (0.5) Consider the following components diagram, in the domain of the automotive industry, built for a multi-purpose display that is commonly used in the vehicles (for instance, it shows diagnostics, the revolutions per minute, the time, or the monitoring of other devices like the GPS, the monitoring of the parking cameras, among other functionalities). Suppose that the car has a GPS. How would you connect the following elements, in this component diagram, knowing that GPS offers one interface (Location) and requires `TimerTick`, which refreshes the location. Choose **all the correct statements** that apply.



A. The provided interface `Location` of the GPS should be connected to the required `Location` of `Video_Display`.
B. The provided interface of the GPS should be connected to the interface provided of `Video_Display`.
C. The required `TimerTick` of the GPS should be connected to the provided interface `TimerTick` of `Video_Display`.
D. The required `TimerTick` of the GPS should be connected to the provided interface `TimerTick` of `Clock`.
E. The required `ExternalDevice` of the `Video_Display` should be connected to the provided interface of GPS.

16. (0.5) Interfaces play a crucial role in the components diagram. About them, we need to know that (identify the **false** statement(s)):

A. Interfaces define a contract.
B. If the programming languages does not support interfaces (e.g. C++ does not have interfaces), we can always use other constructs, namely abstract classes.
C. The interfaces realized by a classifier are called required interfaces.
D. The interfaces separate the specification of the functionality from their implementation.
E. We can use interfaces to specify the class protocols that normally should not be related by inheritance.

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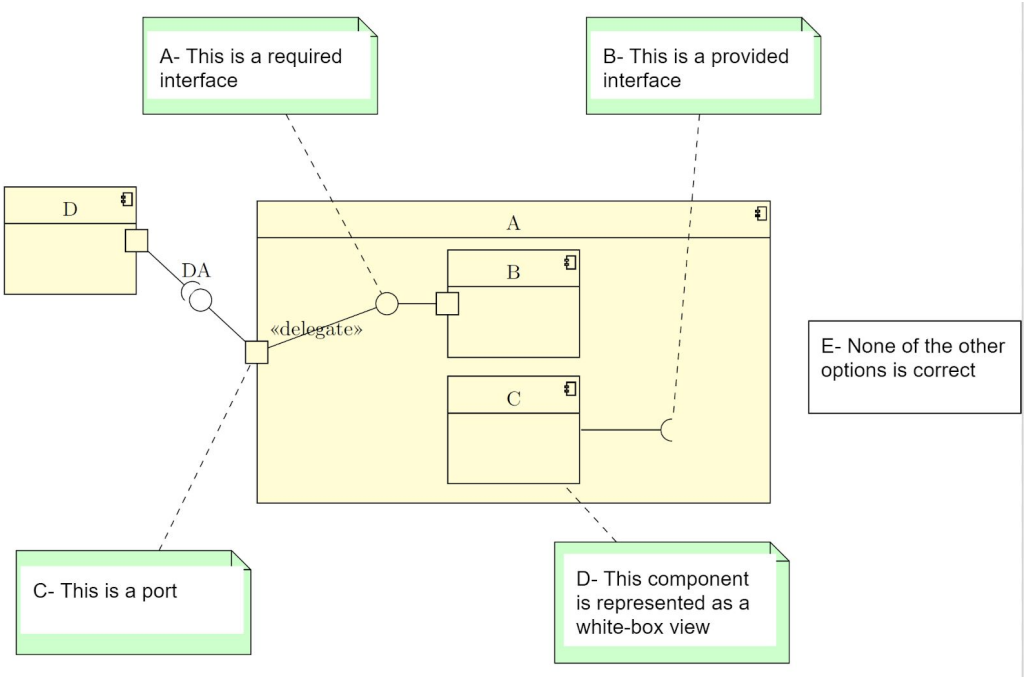
17. (0.5) With regard to the notation presented in the following Component Diagram, choose the **correct** answer.

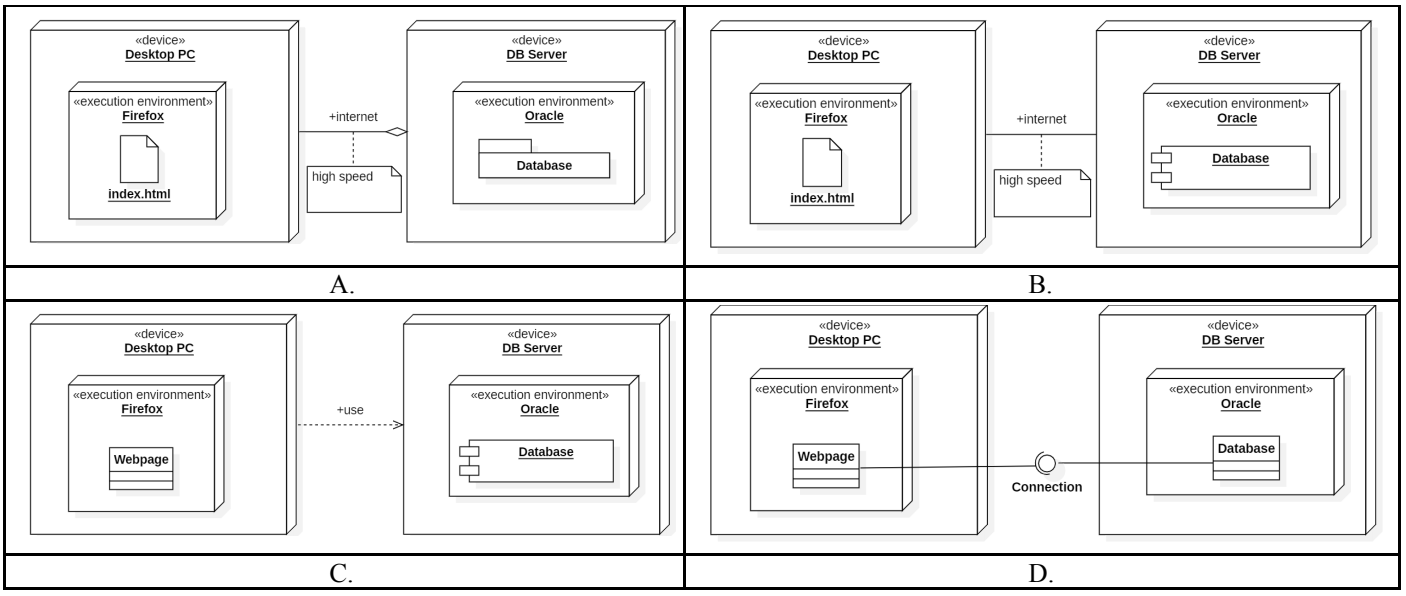


Part 5 – Deployment Diagrams – Answer in the bubble sheet!

18. (0.5) Which of the following notations are generally used in deployment diagrams? Choose the **correct** answer.

A. Stereotypes
B. Boundaries
C. Artifacts and nodes
D. Artifacts and packages.

19. (0.5) Which of the following diagrams is **correct**?



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Part 6 – Earned Value Management (EVM) – Answer in the bubble sheet!

Consider the following description:
Rafael is developing an application for the Tokyo olympic games in 2020. Rafael can allocate 4 work hours, per day, to this project, until it is finished. The prediction for the total duration of the project is of 100 hours, corresponding to 25 working days, distributed in the following manner:

Taks	Hours	Accumulated hours
Planning	6	6
Design	10	16
Design review	9	25
Implementation	30	55
Code review	10	65
Compilation	6	71
Tests and deployment	9	80
Documentation	20	100

On the 2nd working day, Rafael has finished the planning. On the 5th working day, he finished the design. In the 7th working day, he finished the design review. We are now in the 11th working day, and Rafael finished the implementation. Use the Earned Value Management technique, and admit that Rafael will maintain the same work rate and productivity to answer the following questions.

20. (0.5) What is the status for the accumulated **Planned Value (PV)** for the **11th working day**? Choose the **correct** answer.
    A. 6%
    B. 16%
    C. 25%
    D. 55%
    E. 71%

21. (0.5)What is the status for the accumulated **Earned Value (EV)** for the **11th working day?** Choose the **correct** answer.
    A. 6%
    B. 16%
    C. 25%
    D. 55%
    E. 75%

22. (0.5) According to the **Schedule Performance Index (SPI)**, at the end of the **11th day**, Rafael's project is … Choose the **correct answer.**
    A. SPI >0, therefore, the project is advanced
    B. SPI <0, therefore, the project is advanced
    C. SPI>0, therefore, the project is delayed
    D. SPI<0, therefore, the project is delayed
    E. The project is on time

23. (0.5) Maintaining the current pace, after how many days is Rafael going to finish his project? Choose the **correct** answer.
    A. 9 working days
    B. 15 working days
    C. 20 working days
    D. 25 working days
    E. 30 working days

24. (0.5) Consider the following information regarding the evolution and current status of the project you are currently supervising:

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	
Planned Value	500	3000	5500	8000	10500	13000	14000	16500	19000	21500	24000	
Actual costs (	1500	1500	3000	4500	6000	7500	9000	10500	12750	15000	15666,66667	
Earned Value (	500	500	5500	5500	5500	5500	5500	10500	12250	14000	19000	
CPI (EV/AC)	0,33	0,33	1,83	1,22	0,92	0,73	0,61	1,00	0,96	0,93	1,21	
SPI (EV/PV)	1,00	0,17	1,00	0,69	0,52	0,42	0,39	0,64	0,64	0,65	0,79	

Attention: consider a relative error margin of ±10% in the indexes values, meaning that values between 0,9 and 1,1 can be considered approximately 0,9.

On the 8th week (W8), which was the state of the project?

A. The project is on schedule
B. The project is on budget
C. The project is behind schedule
D. The project is under budget
E. The project is ahead of schedule and over budget

Part 7 – Activity on Node (AON) and Activity on Arrow (AOA) – Answer in the bubble sheet!

25. (0.5) Which of the following statements is **true**?
    A. A dummy activity in a project AOA never has zero duration.
    B. In a project network diagram, a sequence of activities may form a loop.
    C. In a project network diagram, every outgoing activity at a node is necessarily a successor to all the incoming activities at the same node.
    D. In project planning, it is possible to delay the completion of critical activities without delaying the entire project.
    E. In a project network diagram, a critical path need not constitute a connected chain of activities between the start and terminal nodes.

26. (0.5) Which of the following statements is **false**?

    A. In a project network diagram, a critical activity must have its total float or slack equal to zero.
    B. The start and completion times for critical activities cannot be changed without necessarily increasing the duration of the entire project.
    C. A non-critical activity can be scheduled anywhere between its earliest start and latest completion times..
    D. In a network diagram, if the network has more than one critical path, the durations of the different paths may not be equal.
    E. Finish-to-Start (FS) relations mean that the activity must finish before the next predecessor can start.

Consider the following activity list for a project:

Activity	Predecessor	Duration
A	-	2
B	-	6
C	-	4
D	A	3
E	C	5
F	A	4
G	B,D,E	2

27. (0.75) The late start of task A is:

    A. 0
    B. 3
    C. 4
    D. 6
    E. 9

28. (0.5) The duration of the project is:
    A. 7
    B. 9
    C. 11
    D. 13
    E. None of the above

29. (0.75) The critical path of the project is:
    A. Start, A, F, End
    B. Start, B, G, End
    C. Start,A,D,G, End
    D. Start, C,E,G, End
    E. None of the above

Part 8 – Software Development Processes – Answer in the bubble sheet!

30. (0.5) Choose the **incorrect** statement regarding the V-Model process:
    A. Testing activities, like planning and test designing, happens well before coding. This saves a lot of time. Hence higher chance of success over the waterfall model.
    B. There is a proactive defect tracking, that is, defects are found at an early stage.
    C. Avoids the downward flow of the defects.
    D. Software is developed during the implementation phase, so no early prototypes of the software are produced.
    E. This process has the same problems as with the prototyping and spiral models.

31. (0.5) The **correct** Agile Principles are:

    A. Customer involvement; People, not process; Incremental delivery; Maintain simplicity (minimal functionality, only product requested, only code and tests); Embrace change.
    B. Incremental delivery; Customer involvement; Team commitment to international standards of societal and ethical values; Embrace change; Maintain simplicity (minimal functionality, only product requested, only documents code and tests).
    C. Maintain simplicity; Embrace change; Incremental delivery; People, not process; Plan in advance; Customer Respect.
    D. Customer involvement; Embrace change; Incremental delivery; Development teams focus; People, not process; Team openness.

32. (0.5) Select the **incorrect** statement regarding Scrum development.
    A. The development team has no more than 7 people.
    B. ScrumMaster is responsible for ensuring Scrum process and avoid outside interference.
    C. Each Sprint iteration takes from 2 to 4 weeks.
    D. There is a backlog proposed by the product owners in the beginning of the process.
    E. Scrum is a daily face-to-face meeting of all team, where the team reviews and prioritizes work.

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Number: _____ Name: _____

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