This is an open book exam – you may use all material in the form of paper, such as books, lecture slides, and own (manually written) notes.

Electronic devices are not permitted! Success!

Dit is een open boek tentamen – je mag alle materiaal in de vorm van papier gebruiken, zoals boeken, college dia's, en eigen (handmatig gemaakte) notities.

Elektronische gereedschappen zijn niet toegestaan! Succes!

PART I – Scenario [25/50 pts]

Imagine you work as software engineer in the automotive industry. Your task is the design of a speed delimiter system (SDS). Once set to a specific set speed, the SDS is supposed to limit the throttle of the vehicle such that the vehicle never exceeds the set speed, even though, the driver pushes the gas pedal down much harder. The SDS has a user interface with a button panel and a display panel. The button panel is supposed to provide

- An ON/OFF switch for switching the SDS on or off, respectively.
- A PAUSE button for enabling/disabling the speed limit if a speed is set.
- A SET+ button for setting the speed limit and increasing it.
- A SET- button for setting the speed limit and decreasing it.

The display panel for the SDS is supposed to show

- the set limit, and "PAUSE LIMIT", if the SDS is switched on but inactive (ON, but not enforcing the limit).
- the set limit, and "ON LIMIT", if the SDS is switched on and active (ON, and enforcing the speed).
- nothing, if the SDS is switched off.

The user of the SDS (the driver) can switch the system ON in order to have the speed limit enforced by the SDS. Once switched ON, the display should show "PAUSE LIMIT", and the set speed limit should show "--- km/h" The requested speed can be set through pressing either of the buttons SET+ or SET-. Pressing these buttons should set the speed limit to the current speed of the vehicle and start limiting the throttle to the set speed limit. Limiting the speed is taken care of by the motor control system. Once the SDS is active and enforcing the limit, pressing SET+ will increase and pressing SET- (for <= 2 seconds) will decrease the set limit of the SDS by 1 Km/h, respectively. Pressing SET+ or SET- for >2s should lead to increase or decrease of the set limit by 5 Km/h, respectively. Pressing the gas pedal down completely (kick down on throttle) should deactivate the SDS.

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This figure illustrates the button panel and the control panel used for the SDS. "Reg" is intended for the speed regulator functionality (cruise control). The display shows the speed in the centre, and the data for the SDS at the top.

Question/Assignment 1 [3 pts]

Prepare a domain glossary for the scenario described above. Classify the domain concepts into concepts for structure and concepts for behaviour.

Maak een domein glossarium voor de bovenstaande scenario. Deel de domein concepten in naar concepten voor structuur en voor gedraag.

Question/Assignment 2 [5 pts]

Draw a use case diagram for the scenario described above.

Teken een use case diagram voor het bovenstaande scenario.

Question/Assignment 3 [7 pts]

Draw a UML structural diagram for the scenario, representing the CCS in its operating context.

Teken een UML structuur diagram die het CCS in zijn context weer geeft.

Question/Assignment 4 [6 pts]

Draw a suitable UML behaviour diagram that represents the full behaviour described in the scenario.

Teken een geschikte UML gedraag diagramma die het heel gedraag in het scenario goed weer geeft.

Question/Assignment 5 [4 pts]

Draw a sequence diagram specifying one specific usage scenario of the SDS (choose one).

Teken een sequence diagramma welke een bepaalde usage scenario specificeerd (kies een).

Part II – Open Questions [25/50 pts]

Question 6 [5 pts]

What makes software development difficult; compared to other engineering disciplines? Provide 5 arguments!

Wat maakt software ontwikkeling moelijk; in vergelijking met andere engineering disciplines? Geef 5 argumenten!

Question 7 [1 pt]

Why is abstraction such an essential concept in software engineering? Provide 1 argument!

Waarom is abstractie zo'n essentieel concept in software engineering? Geef 1 argument!

Question 8 [2 pts]

How can the domain glossary be used to make an initial design of a system? Provide 2 arguments!

Hoe kan het domain glossary gebruikt worden voor een initieel system design? Geef 2 argumenten!

Question 9 [1 pt]

How does the façade pattern facilitate cohesion? Provide 1 argument!

Hoe vergemakkelijkt het façade pattern cohesion? Geef 1 argument!

Question 10 [1 pt]

Why should software entities be open for extension but closed for modification? Provide 1 argument!

Waarom zouden software entiteiten "open" zijn voor extensie maar "closed" voor modificatie? Geef 1 argument!

Question 11 [1 pt]

Would you associate code reviews with verification or validation? Motivate your answer with one argument!

Zou je code reviews met verfication associëren of met validation? Motiveer je antwoord met een argument!

Question 12 [2 pt]

Discuss the tradeoffs of software reuse with respect to software cost? Provide 1 positive and 1 negative argument!

Bespreek de trade-offs van software reuse in verhouding met software cost? Geef 1positieve en 1 negatieve argument!

Question 13 [1 pt]

How can maintainability be measured objectively? Provide 1 example for 1 objective maintainability measure!

Hoe can maintainability objectief worden gemeten! Geef 1 voorbeeld voor 1 objectief maintainability meeteenheid.

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Question 14 [1 pts]

What is a potential flaw with function point measures, such as Albrecht, Cocomo2, or DeMarco? Give 1 argument!

Wat is een potentieel gebrek bij function point measures, zoals Albrecht, Cocomo2, of DeMarco? Geef 1 argument!

Question 15 [1 pts]

Why can coupling be used to express testability? Provide 1 argument.

Waarom kan coupling gebruikt worden om testability uit te drukken? Geef 1 argument!

Question 16 [2 pts]

Scrum and extreme programming are both agile methods, but what are their differences? Provide 2 arguments?

Scrum en extreme programming zijn allebij agile methoden, maar wat zijn hun verschillen? Geef 2 argumenten!

Question 17 [3 pt]

What is the difference between a measure and a metric? Provide 3 arguments!

Wat is het verschil tussen een "measure" en een "metric"? Geef 3 argumenten!

Question 18 [2 pt]

Many software metrics are "on interval scale." What does that mean? Provide at least 2 arguments.

Veele software metrics zijn "on interval scale." Wat betekent dit? Geef tenminste 2 argumenten.

Question 19 [1 pt]

Structural complexity measures fail to express cognitive complexity. Where can they be used effectively? Provide 1 example!

Structural complexity measures zijn onvoldoende voor cognitive complexity. Waar kunnen ze wel worden gebruikt? Geef 1 voorbeeld!

Question 20 [1 pts]

What is the fitness function in search based software engineering applied to performance engineering? Provide 1 argument!

Wat is de fitness functie in search based software engineering toegepast op performace engineering? Geef 1 argument!