

Institutionen för informationsteknologi

TENTAMEN

Kurs **Software Engineering**

Examinationsmoment **Salstentamen**

Kurskod **IT398G**

Högskolepoäng för examinationsmomentet 3hp

Datum **2026-05-08**

Tentamenstid **14:15-18:30**

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Berörda lärare Henrik Gustavsson, Jörgen Hansson

Hjälpmedel/bilagor

Övrigt

Grade points: 60 (10 for each of the six parts) Answer in Swedish or English. Answer all the questions.

Each question has an equal weight of 10 marks. The final grade is calculated from these marks. To pass the exam, you must have at least 25 marks in total on all sections combined.

- Anvisningar
- Ta nytt blad för varje lärare
 - Ta nytt blad för varje ny fråga
 - Skriv endast på en sida av papperet.
 - Skriv namn och personnummer på samtliga inlämnade blad.
 - Numrera lösbladen löpande.
 - Använd inte röd penna.
 - Markera med kryss på omslaget vilka uppgifter som är lösta.

Poänggränser

Skrivningsresultat bör offentliggöras inom 18 arbetsdagar

Lycka till!

Antal sidor totalt



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Question 1: System modelling and design (10p)

- a) Describe what model driven engineering is and how it relates to agile methods. Give a short discussion regarding the possibilities of using model driven engineering and the current availability of model driven engineering toolsets. (6p)
- b) Does implementing an object-oriented model require an object-oriented programming language? Give a short discussion that motivates your answer. (2p)
- c) Which one of the following licenses is considered to be the **least permissive** (*most restrictions*) licence when it comes to requiring publishing code that is based on code with that license. Give a short motivation for your selection (2p)
 - 1) Apache License
 - 2) BSD License
 - 3) GPL License
 - 4) LGPL License
 - 5) MIT License

Question 2: Testing (10p)

- a) Describe and contrast validation testing and defect testing. Give an example of a typical error of each type. (4p)
- b) Describe how unit testing is different from component testing. (2p)
- c) Which one of the following types of tests commonly considered to be a type of user testing. Give a short motivation for your selection (2p)
 - 1) Release testing
 - 2) Alpha testing
 - 3) System testing
 - 4) Use-Case testing
- d) Which one of the following types of models is most suited for modelling business processes (process perspective). Give a short motivation for your selection (2p)
 - 1) Class Diagram
 - 2) Use-case Diagram
 - 3) Activity Diagram
 - 4) State Chart Diagram
 - 5) Sequence Diagram

Question 3: Tool Support, Evolution and Internet software (10p)

- a) Which **two** of the following strategies are valid candidates for handling a legacy system with low quality but high business value. Give a short motivation for your selection. (2p)
 - 1) Scrap
 - 2) Re-Engineer
 - 3) Continue Normal Maintenance
 - 4) Replace
- b) Which one of the following activities is **not** part of refactoring. Give a short motivation for your selection (2p)
 - 1) Improve code structure
 - 2) Increase readability
 - 3) Improve functionality
 - 4) Reduce complexity
- c) Explain what a microservice architecture is, and how a microservice architecture can be useful for a dashboard application that displays things such as the current weather, current electricity spot pricing and local bus schedules. Outline how microservice architectures affects



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deployment of such an application (6p)

Question 4: Agile, Scrum and XP (10p)

For each question, you must: (i) select one alternative and provide a justification in 2–5 sentences explaining your choice. Scoring is as follows. 2 points: Correct choice and a clear, accurate justification. 1 point: Correct choice and a justification that shows clear understanding but lacks precision or completeness. 0 points: All other cases. Thus, no points are awarded for a correct choice without a justification; no points are awarded for an incorrect choice. (10p)

- a) Scrum vs XP – focus. Which statement best captures a key difference between Scrum and Extreme Programming? Justify your answer / reason about the correctness of your choice (2–5 sentences).
- 1) Scrum requires pair programming, while XP does not
 - 2) Scrum eliminates the need for testing practices emphasized in XP
 - 3) XP emphasizes practices such as testing and refactoring more than Scrum
 - 4) XP does not support iterative development
 - 5) Scrum focuses more on engineering practices, while XP focuses on management
 - 6) XP does not involve customer feedback
- b) Iteration and delivery. Which statement is most correct? Justify your answer / reason about the correctness of your choice (2–5 sentences).
- 1) Scrum uses iterations, while XP does not
 - 2) XP uses continuous integration and frequent releases as core practices
 - 3) Scrum requires a fully defined architecture before development begins
 - 4) XP avoids incremental delivery
 - 5) Scrum prohibits releasing incomplete functionality
 - 6) Agile methods avoid iterative development
- c) Technical practices vs process control. Which statement is most correct? Justify your answer / reason about the correctness of your choice (2–5 sentences).
- 1) Scrum provides detailed guidance on coding practices
 - 2) XP does not include testing as a core activity
 - 3) Scrum replaces the need for engineering discipline
 - 4) XP focuses heavily on technical practices such as test-first development
 - 5) Scrum requires continuous integration as a formal rule
 - 6) XP eliminates the need for planning
- d) Role of documentation. Which statement is most correct? Justify your answer / reason about the correctness of your choice (2–5 sentences).
- 1) Agile approaches favor lightweight documentation that evolves with the system
 - 2) Scrum requires complete documentation before development starts
 - 3) XP discourages all forms of documentation
 - 4) Scrum replaces documentation with code comments
 - 5) XP requires formal specification documents
 - 6) Agile, Scrum, and XP eliminate the need for documentation entirely
- e) Refactoring and evolution. Which statement is most correct? Justify your answer / reason about the correctness of your choice (2–5 sentences).
- 1) Scrum defines refactoring as a formal process activity
 - 2) Refactoring is avoided in agile methods to maintain stability
 - 3) Scrum prohibits code changes during a sprint
 - 4) XP replaces refactoring with redesign phases
 - 5) Refactoring is only performed after system completion
 - 6) XP explicitly promotes continuous refactoring as part of development



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Question 5: Architectural Trade-offs (10p)

- a) You are to design a distributed system for real-time monitoring of sensor data. Analyze the advantages and disadvantages of using a pipe-and-filter architecture, repository architecture versus a client-server architecture. Focus on aspects such as scalability, response times (latency), and the system's fault tolerance. (10p)

Question 6: Dependable Systems(10p)

For each question, you must: (i) select one alternative and provide a justification in 2–5 sentences explaining your choice. Scoring is as follows. 2 points: Correct choice and a clear, accurate justification. 1 point: Correct choice and a justification that shows clear understanding but lacks precision or completeness. 0 points: All other cases. Thus, no points are awarded for a correct choice without a justification; no points are awarded for an incorrect choice. (10p)

- a) Layered architecture and real-time properties. Which statement is most correct regarding layered architecture in systems with hard real-time requirements? Justify your answer / reason about the correctness of your choice (2–5 sentences)
- 1) Layering guarantees constant execution time
 - 2) Layering eliminates the need for scheduling
 - 3) Layering makes all dependencies explicit and therefore time-predictable
 - 4) Layering can introduce latency due to multiple function calls
 - 5) Layering is incompatible with real-time systems
 - 6) Layering always improves time determinism
- b) Repository architecture. Which statement is most correct? Justify your answer / reason about the correctness of your choice (2–5 sentences).
- 1) Repository architecture improves performance in all cases
 - 2) Repository architecture prevents parallelism
 - 3) Repository architecture eliminates data inconsistency
 - 4) Repository architecture can create a single point of failure
 - 5) Repository architecture is only used in small systems
 - 6) Repository architecture lacks a central data model
- c) Limitations of redundancy Which statement is most correct? Justify your answer / reason about the correctness of your choice (2–5 sentences).
- 1) Redundancy is effective only if faults are independent
 - 2) Redundancy always improves safety
 - 3) Redundancy eliminates design faults
 - 4) Redundancy works independently of the nature of faults
 - 5) Redundancy reduces system complexity
 - 6) Redundancy makes testing unnecessary
- d) Triple Modular Redundancy (TMR) Which statement is most correct? Justify your answer / reason about the correctness of your choice (2–5 sentences).
- 1) TMR eliminates all types of faults
 - 2) TMR guarantees correct output regardless of fault type
 - 3) TMR relies on majority voting between parallel outputs
 - 4) TMR reduces the need for redundancy
 - 5) TMR requires three identical implementations without a voter
 - 6) TMR only works for software faults



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- e) Diversification to improve software quality. Which statement is most correct? Justify your answer / reason about the correctness of your choice (2–5 sentences).
- 1) Diversification eliminates all common faults
 - 2) Diversification reduces development cost
 - 3) Diversification requires identical implementations
 - 4) Diversification makes voter components unnecessary
 - 5) Independent implementations may still share incorrect assumptions
 - 6) Diversification is only used in hardware