

EXAM SOFTWARE MANAGEMENT (192320501)

Instructions:

This is an open book exam regarding the slides in this course – it is allowed to consult any slides provided by the teachers. Be sure to switch mobile phones off and store them in a closed bag. Be sure to indicate name, program and student number on each sheet. Grade for the exam is Round (Sum of Points / 10). Concise yet complete answers are better than long-winded answers.

Note: whenever you have to motivate your answer, 1 point goes for simply writing the answer and the rest of the points go for writing the motivation. Do not forget the motivation!!

Success!!

Question 1 (26 points)

1.1 Suggest the most appropriate generic software process model that might be used as a basis for managing the development of the following systems:

- a) A system to control anti-lock braking in a car
- b) An online game (think of Angry Birds or any other game)
- c) A university salary payout management system that replaces an existing system
- d) An interactive travel planning system that helps users plan journeys with the lowest environmental impact

Motivate your choices. (10 points)

1.2 There are three important differences between software project management and other types of project management. Each of these differences poses risks that project managers have to deal with. Explain what the risks are regarding each difference. (8 points)

1.3 Fixed-price contracts, where the contractor bids a fixed price to complete a system development, may be used to move project risk from client to contractor. If anything goes wrong, the contractor has to pay. Suggest how the use of such contracts may increase the likelihood that product risks will arise. (8 points)

Question 2 (23 points)

2.1 What are the important differences between the agile approach to software process improvement and the process maturity approach to software process improvement? (3 points)

2.2 You work on a project in which the team will use agile approach to project management and development (assume XP and Scrum). Will your Scrum Master (this is the project manager) need to create a project plan for this project? **Motivate your answer.** (5 points).

2.3 Make a list of five benefits from using the Scrum agile project management approach. (5 points)

2.4 Would be an incentive for a CMMI 5 Level organization to embark on agile as the next step to software process improvement? **Motivate your answer** (5 points).

2.5 Under what circumstances would you recommend the use of the staged representation of the CMMI? (6)

Question 3 (17 points)

3.1 Assume you work for an organization that develops database products for small businesses. This organization is interested in quantifying its software development. Suggest appropriate metrics based on your knowledge of metrics covered in this course, e.g. the chapter of Sommerville's book and the slides of Christoph Bockisch. (8 points)

3.2. Assume the organization introduced in Question 1.3, uses agile software development process. Would it be meaningful to use Function Points to estimate the size of the produced database system? **Motivate your answer.** (4 points)

3.3. Describe the context of a project for which you think it's suitable to use the Lines of Code metric for sizing? (5 points)

Question 4 (24 points)

4.1. Why should several estimation techniques be used to produce a cost estimate for a large, complex software system? (6 points)

4.2. Write two differences between expert-judgment based estimation methods and algorithmic methods. (4 points)

4.4. Under what circumstances might a company justifiably charge a much higher price for a software system than the software cost estimate plus a reasonable profit margin? (5 points)

4.5. COCOMO 2 offers four models. Which of them do you think is most suitable in a company that wants to implement a new system for which the requirements and the architectural design are known but no detailed implementation is known yet and the team has no prior experience in using the programming language and the technology. **Motivate your choice.** (5 points).

4.6. Imagine you are a project manager in a consulting company that is preparing a bid to a client to develop software. You met informally with the client and learnt what his expectations are about the price. You have no to estimate the project. Is the pricing information likely to help or hurt your estimation process? **Motivate your answer.** (4 points).

Question 5 (10 points)

5.1 In the definition of the Chidamber & Kemerer (CK) metric LCOM, a very specific definition of "cohesiveness" is used. Discuss a potential shortcoming of this definition. Give an example for which the CK definition of LCOM would rate the cohesiveness in an unintuitive way. Argue why you think that the measure is unintuitive. (5 points)

5.2 In your software project (consisting of six classes), the classes **A**, **B**, **C**, and **E** have to be modified to realize a new feature. For all classes in your project, you have measured the metrics "*Number of Children*" (NOC), "*Fan-In*" and "*Fan-Out*". You want to figure out, how risky this change is, i.e.: how much do the rest of the classes depend on the changed ones.

| Class | NOC | Fan-In | Fan-Out |
|----------|-----|--------|---------|
| A | 2 | 4 | 4 |
| B | 0 | 3 | 5 |
| C | 3 | 1 | 2 |
| D | 0 | 2 | 1 |
| E | 0 | 5 | 2 |
| F | 0 | 2 | 3 |

For two of these metrics, a large value indicates that many other classes depend on the class in question. For these two metrics answer the following questions: (a) What is their operational definition (i.e., what is measured)? (b) Explain how they characterize the dependency of the rest of a system on a class (i.e., what is the intuition behind a large value for this metric). (c) Given the measures in the table, do you consider the intended change risky? – Explain your answer and if applicable give examples of risks. (3 points)

5.3 Metrics are a way to determine the quality of existing code and give hints how to improve the quality. Name one method that proactively aims at producing code in a good quality. Explain the rationale and the approach of this method and give an example. (2 points)