**Eastern Mediterranean University - Computer Engineering Department**

**Software Engineering Program**

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

**Std Id\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Std Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Instructor: Prof, Dr, Alexander G, Chefranov**

**Duration: 120 Minutes June 7, 2024**

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**Five A4 sheets of paper with *your* *handwritings* (not photocopies, printouts, etc,) may be used for your help, Calculators are allowed, Other electronic devices (phones, laptops, etc,) are not allowed**

**There are 12 questions (totally, 100 points), 10 pages**

**Good Luck!**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Question | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Total |
| Point | 8 | 8 | 8 | 9 | 18 | 9 | 9 | 12 | 9 | 3 | 4 | 3 | 100 |
| Grade |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Before MT Exam questions Q1-Q4 (33 points)**

Q1) **8 points** Introduction

1. **4 points** Explain why diversity of the problems is considered as one of the main software engineering challenges

The diversity of the problems is considered as one of the main software engineering challenges because the software engineer needs to be proficient in all application domains which is practically impossible because software engineers get education covering a limited spectrum of knowledge, and deficient knowledge shall be gained by self-education,

1. **4 points** What is the difference between embedded and scientific application types?

Embedded applications are related with the processing of sensors data and elaborating control signals for real-world objects, whereas scientific applications are related with simulation of natural objects and reporting on the simulation results,

Q2) **8 points** SDLC models

1. **4 points** Why the incremental development model allows for the early customer feedback and reduced delivery time?

The incremental development model (IDM) allows getting early customer feedback because it is obtained after each increment delivery, The development time is reduced in the IDM with respect to the water-fall model because the risk of rework due to misunderstanding of the customer requirements is minimized, Also, different increments can be worked on in parallel, thus reducing development time,

1. **4 points** Why planning and risk analysis are important parts of the spiral development model?

Planning is important because it is necessary to know what exactly is expected to be done by some time ahead so that to finish the project timely, The risk analysis is important since it allows to be prepared to possible problems in advance, and if really happening, just use prepared in advance contingency plan

Q3) **8 points** Requirements engineering

1. **4 points** What are the three types of expected readers of the user requirements?

End-users, managers, software architects

1. **4 points** Give an example of a non-functional requirement user requirement for the system of flight tickets reservation

Time to find all variants of the user itinerary shall not exceed one minute,

Q4) **9 points** Project management

1. **4 points** What are the three main project type risks? What the contingency plan is?

Three main project risks are: 1) Staff turnover; 2) Management change; 3) Requirements change

The contingency plan is a description of actions to be done in the case of some emergency happening

1. **5 points** Consider the below materials from the lecture notes and explain why in one case the estimated loss is less than $2 M, whereas in the second case it exceeds $16 M?

|  |  |
| --- | --- |
| **There is**  **ctitical fault**  **NO**  **ctitical fault**  **CONDITIONS** |  |

In the case of doing regression the probability of not finding a critical fault with weight $ 30M is just 5%, hence its expected loss is 0,05\*30 M= 1,5 M, However, for the second case when regression testing is not used, the probability of not finding a critical fault is 55%, hence, its expected loss is 0,55\*30 M = 15,5 M, Thus, resulting losses differ about ten times,

**After MT Exam questions Q5-Q12**

**Q5) 18 points** Project planning

For the task set given in tabular form as

|  |  |  |
| --- | --- | --- |
| Task | Preceding tasks | Duration (work day) |
| A | - | 3 |
| B | - | 4 |
| C | A,B | 6 |
| D | A | 8 |
| E | B | 3 |
| F | C,D,E | 2 |

1. **6 points** Build an activity network diagram, Give necessary explanations,

A

B

C

D

E

F

We connect dependent tasks by an edge directed from a predecessor to the successor

1. **12 points** Fill in the table below by the tasks’ A,,F Early start, Early finish, Late start, and Late finish time, and indicate tasks lying on a critical path, Define the critical path length, Give necessary explanations, show your calculations,

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Task** | **Duration** | **Early Start** | **Early Finish** | **Late Start** | **Late Finish** | **Critical path task (yes, no)** |
| **A** | **3** | **0** | **3** | **0** | **3** | **Yes** |
| **B** | **4** | **0** | **4** | **1** | **5** | **No** |
| **C** | **6** | **4** | **10** | **5** | **11** | **No** |
| **D** | **8** | **3** | **11** | **3** | **11** | **Yes** |
| **E** | **3** | **4** | **7** | **8** | **11** | **No** |
| **F** | **2** | **11** | **13** | **11** | **13** | **Yes** |

We set Early start of the tasks not having predecessors to zero, Early finish of a task is calculated as Early\_finish = Early\_start + Duration, If a task has predecessors, its early start is the maximam of early finish time of its predecessors, Maximal early finish defines the project overall duration, or the critical path length, The critical path includes A, D, and F, and its length is 13, Late finish time of the tasks with the maximal early finish time and of the tasks not having successors is equal to the project overall duration, Late start time of a task is Late\_start = Late\_finish -Duration, Late finish time of the tasks having successors is equal to the minimal late start of its successors,

Q6, **9 points** COCOMO

For the 354 KLOC-sized project what is the time to complete if using the Basic COCOMO Embedded mode? Explain your calculations,

A screenshot of a cell phone

Description automatically generated

1. Calculate Effort: E=a\*size^b = 3,6\*354^1,2=3,6\*1145=4122 p\*m
2. Calculate Duration: D=c\*E^d= 2,5\*4122^0,32 = 2,5\*14,35=35,9 month

Q7, **9 points** Architectural design

1. **5 points** What is a system architecture? What are the two uses of a system architecture?

A system architecture is a high-level presentation of the system as a structure showing subsystems of the system and relations between them, Two uses of the system architecture: 1) it is used in the discussions with stakeholders on the system as a whole; 2) it is used by the development team for defining subsystems internals and interfaces

1. **4 points** What three main decisions about the system shall be made by system architects?

Three decisions are on 1) Architectural style to be used; 2) how to decompose a system into subsystems; 3) what architecture satisfies the non-functional constraints

Q8, **12 points** System models

1. **4 points** What the sequence diagram is, what are its elements?

The sequence diagram is a diagram showing time sequence of interactions of the system actors, The elements of the diagram are: actors, their timelines, life-time boxes, arrows, messages represented as function calls, responses, boxes representing loops and alternatives,

1. **8 points** Consider the diagram below from the Lecture notes and answer the following questions: What about this diagram is? Who are the actors? Who initiates the process? How many actors are involved in the process? What is the meaning of ALT? What for the ALT element is used in the diagram?

5.6 ViewInfo Seq Diag.eps

The diagram presents Viewinfo use-case, The actors of the diagram are: Medical receptionist, P, D, and AS, The process is initiated by Medical receptionist, Four actors are involved in the process, ALT element defines alternatives in the process, ALT element is used in the diagram to specify the process in the cases of successful and failing authentication,

Q9, **9 points** Testing

1. **3 points** What is a stub? What is a driver? What for stubs and drivers are used in testing?

A stub is a substitute of lower-level function that is not yet implemented: it has the function name and interface but its body is just an operator returning predefined values, A driver is a substitute of the higher-level function not yet implemented; it just calls lower-level functions with given actual parameters, Stubs and drivers are used in testing when respective level functions are not yet implemented but they are to be used together with the currently tested functions,

1. **3 points** What are the four interface types?

The four interface types are 1) data parameters; 2) shared memory; 3) procedural parameters; 4) message-passing

1. **3 points** What are the three types of interface errors?

The three types of interface errors are: 1) misuse; 2) misunderstanding; 3) timing errors

Q10, **3 points** Quality management

What are the three phases in the review process?

The three phases are: 1) pre-review activities; 2) review meeting: 3) post-review activities,

Q11, **4 points** Configuration management

What are the four configuration management activities?

The four configuration management activities are: 1) version management; 2) system building; 3) change management; 4) release management

Q12, **3 points** SW processes

What are the four design activities?

The four design activities are: 1) architectural design; 2) component design; 3) interface design; 4) database design