

# Exam Solution

CSE 5325: Software Project Management

Fall 2021  
Dr. Khalili

Midterm Exam: Tuesday Oct. 12, 2021  
11:00 - 12:20 PM

Last Name: \_\_\_\_\_

First Name: \_\_\_\_\_

Mav id: \_\_\_\_\_

**Exam duration: 1 hour and 20 minutes; Closed book, closed notes, calculator allowed; use back of each page if you need additional space**

Each multiple-choice question has 3 points; all other questions have their points listed.  
Circle your selected multiple-choice answer (only one selection):

Q1) Considering the principles of Software Engineering *Ethics*, which of the following must be considered the top priority:

- A. Self interest
- B. Client interest
- C. Public interest**
- D. Employer interest

Q2) Which of the following is NOT one of the Reddin's management style:

- A. Separation style
- B. Commitment style
- C. Rational style**
- D. Integration style

Q3) Which of the following is correct as it relates to "time boxing" in DSDM:

- A. Time, Resource, Functionality**
- B. Time, Quality, Functionality
- C. Resource, Schedule, Quality
- D. People, Process, Product

Q4) In the context of "Project Control", the variable that cannot be controlled such as the experience of the user is referred to as:

- A. Goal variable
- B. Regular variable
- C. Irregular variable**
- D. Uncontrollable variable

Q5) In the context of "Project Control", the archetypical control situation when all certainties are high, is called:

- A. Realization problem**
- B. Allocation problem
- C. Design problem
- D. Exploration problem

Q6) Which of the following is NOT part of the “*Open Source Software Development*” organization:

- A. Active user
- B. Passive user
- C. Beta team**
- D. Core team

Q7) ISO 9126 measures “quality in use” as the extent to which users can achieve their goal. Quality in use is modeled in four characteristics. Which of the following is NOT one of those characteristics?

- A. Effectiveness
- B. Productivity
- C. Satisfaction
- D. Security**

Q8) Which of the following is not considered as a software evolution law:

- A. Law of continuing change
- B. Law of decreasingly complexity**
- C. Law of program evolution
- D. Law of invariant work rate
- E. Law of incremental growth limit

Q9) Which of the following is NOT considered as a phase in RUP:

- A. Inception
- B. Implementation**
- C. Construction
- D. Transition

Q10) In what year and by which institution the term “Software Engineering” first introduced:

- A. 1968 NATO**
- B. 1970 US Air force
- C. 1982 FSDM
- D. 1960 IBM

Q11) (5 points) List Mintzberg's principles of coordination mechanism (just list, don't describe):

- **Simple: direct supervision**
- **Machine bureaucracy**
- **Divisionalized form**
- **Professional bureaucracy**
- **Worker bureaucracy**

Q12) (5 points total) What is Agile Manifesto?

- **Individuals and interactions over processes and tools**
- **Working software over comprehensive documentation**
- **Customer collaboration over contract negotiation**
- **Responding to change over following a plan**

Q13) (5 points) What are the 5 areas project manager should consider for “Project Control”?

- **Time, both the number of man-months and the schedule**
- **Information, mostly the documentation**
- **Organization, people and team aspects**
- **Quality, not an add-on feature; it has to be built in**
- **Money, largely personnel**

Q14) (5 points) What is ISO? What is the difference between ISO 9126 and ISO 9001?

**ISO: International Organization for Standardization**  
**Establishes standards for processes and products**

**Process: ISO 9001 (it is sufficient if they just mention ISO 9001 is for Process standards and 9126 for Product standards)**

- **Model for quality assurance in design, development, production, installation and servicing**

**Product: ISO 9126**

- **ISO 9126 measures ‘quality in use’: the extent to which users can achieve their goal**

Q15) (5 points) In the context of Configuration Management, what is the difference between “Version-oriented” vs. “Change-oriented” models of configuration:

- **version-oriented: physical change results in a new version, so versions are characterized by their difference, i.e. delta**
- **change-oriented: basic unit in configuration management is a logical change**

Q16) (5 points) List the five levels of the *Capability Maturity Model (CMM)*, (just list, no need to describe):

- **Initial level: software development is ad-hoc**
- **Repeatable level: basic processes are in place**
- **Defined level: there are *standard* processes**
- **Quantitatively managed level: data is gathered and analyzed routinely**
- **Optimizing level: stable base, data is gathered to improve the process**

Q17) (5 points total) Answer the following questions in the context of Software “Maintenance”:

a) (1 point) What is Software maintenance?

**Modifying software after it has been put into use for tackling defects, performing adjustments and evolutions.**

b) (3 points) List the three kinds of maintenance activities (just list, don’t describe):

- **Corrective maintenance: correcting errors**
- **Adaptive maintenance: adapting to changes in the environment (both hardware and software)**
- **Perfective maintenance: adapting to changing user requirements**

c) (1 point) Which of the above three consumes the highest percentage of maintenance effort?

**Perfective maintenance**

Q18) (10 points) Provide a brief answer to the following in the space provided below:

a) List at least 5 commonly accepted team organizations:

- **Hierarchical organization**
- **Matrix organization**
- **Chief programmer team**
- **SWAT team**
- **Agile team/Extreme Programming (XP)**
- **Open Source Development**

b) What is “Planning poker” used for?

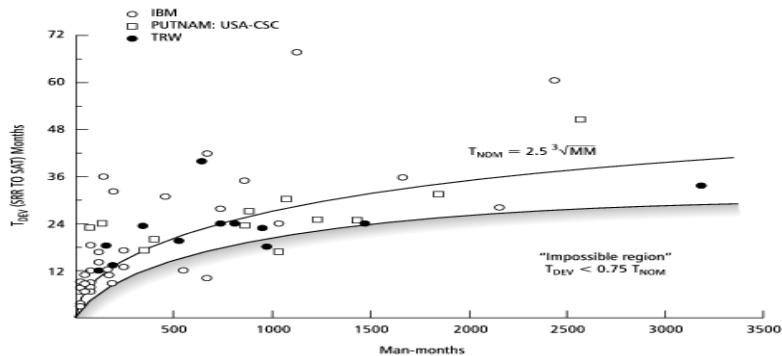
**Planning poker is an agile software estimation technique.**

c) What is “Closed loop Principle” (in data collection)?

**Result of data analysis must be useful to supplier of data**

d) What is Impossible region (in cost estimation)?

**Regardless of adding more resources, one cannot reduce the time by more than 25% of its initial time estimate.**





Q19) (25 points total) Considering COCOMO, answer the following questions (6 parts):

A. (2.5 points) List the definition of SLOC in COCOMO:

- **Only Source lines that are DELIVERED as part of the product are included -- test drivers and other support software is excluded**
- **SOURCE lines are created by the project staff -- code created by applications generators is excluded**
- **One SLOC is one logical line of code**
- **Declarations are counted as SLOC**
- **Comments are not counted as SLOC**

B. (2.5 points) List COCOMO 5 scale driver:

- **Precedentedness**
- **Development Flexibility**
- **Architecture / Risk Resolution**
- **Team Cohesion**
- **Process Maturity**

C. (2 points) List 4 general categories that “Cost drivers” cover:

- ***Personnel factors***
- ***Project factors***
- ***Platform factors***
- ***Product factors***

- D. (6 points) Assume a project with the nominal scale drivers (i.e. all five of the scale drivers are 1.0, i.e. **E=1**) and project is rated Very High for Complexity (effort multiplier of 1.34), and aggressive for Required Development Time (effort multiplier of 1.40), and all of the other cost drivers are rated to be Nominal (effort multiplier of 1.00), consists of 20,000 source lines of code. What is the estimated **Effort**? Make sure to include the unit of this effort. Please round up all numbers to 2 digits after the decimal points.

$$\text{Effort} = 2.94 * \text{EAF} * (\text{KSLOC})^E$$

Where

**EAF** Is the Effort Adjustment Factor derived from the Cost Drivers  
 $= 1.34 \times 1.40 = 1.876$

**E** Is an exponent derived from the five Scale Drivers = 1

$$\text{Effort} = 2.94 * (1.876) * (20)^{1.0} = 110.30 \text{ Person-Months}$$

- E. (6 points) Assume this project (from part B above) has a **SE of 0.3**, what is the Duration of this project? What is the average staffing for this project (i.e. how many people do we need)? Make sure to include the unit of this effort. Please round up all numbers to 2 digits after the decimal points.

$$\text{Duration} = 3.67 * (\text{Effort})^{\text{SE}}$$

Where

**Effort** Is the effort from the COCOMO II effort equation

**SE** Is the schedule equation exponent derived from 5 Scale Drivers

$$\text{Duration} = 3.67 * (\text{Effort})^{\text{SE}} = 3.67 * (110.30)^{0.3} = 3.67 \times 4.10 = 15.05 \text{ months}$$

$$\text{Average staffing} = \text{effort} / \text{duration}$$

$$\text{Average staffing} = 110.30 / 15.05 = 7.33 \text{ people}$$

- F. (6 points) The senior management is not comfortable with the Effort and Duration presented in parts (B) and (C) above and has asked you to speed the project up and reduce the total time as much as possible. This causes the cost factor SCED rating of Very Low which corresponds to an Effort Multiplier of 1.43. Re-compute Effort, Duration, and Average staffing under this new scenario. Please round up all numbers to 2 digits after the decimal points:

**Duration = 0.75% x 15.05 = 11.29 months (i.e. 25% reduction maximum)**

**EAF = 1.34 x 1.40 x 1.43 = 2.68**

**Effort = 2.94 \* (2.68) \* (20)\*\*1.0 = 157.58 Person-Months**

**Average staffing = 157.58 / 11.29 = 13.96 people (i.e. 14 people)**