

IIIT-Hyderabad

Course: Design and Analysis of Software Systems (2023)

End-Semester Examination (50 marks)

Duration- 2 hrs

All questions to be answered based on the class discussions and the course project. Please answer within required length limits. [Penalties for long/unnecessary answers.]

Part 1: Concepts

[20 marks]

Answer any 8 questions | Word Limit: 50 Words

1. Explain **evolutionary model** with **iteration**. (2)
2. Explain the **Spiral Model** and describe **any one** of the four quadrants. (2)
3. What are the major problems with the **classical waterfall model**? (2)
4. Why are **lifecycle models** followed in software projects? (2)
5. Briefly define **agile requirements modeling**. (2)
6. Differentiate between **programs** and software **products** (2 differences). (2)
7. List any **2 modeling challenges** specific to AGILE requirements modeling. (2)
8. List the **2 different types** of software (with brief explanation). (2)
9. List **2 different users** of Product Labs' badminton shot analysis tool (discussed in guest talk). (2)
10. What is **voice** in UX design? What is **tone** (UX)? (2)

Part 2: Design

[15 marks]

11. Briefly explain **any 5 of the 10 key principles** (one paragraphs each) of UX Design **using diagrams** when applicable. (15)

Part 3: Project

[15 marks]

12. For your project, explain the **sprint-wise plan** for each of the **4 active dev sprints** along with the **backlog items** for each sprint (4-6 items per sprint). (15)

Answer Key

Question 1:

- a. Evolutionary model with iteration uses a combination of iterative and incremental development. (1)
It includes the following features:
 - i. a new release may include new functionality (0.5)
 - ii. existing functionality from the current release may also have been modified. (0.5)

Question 2:

The Spiral model is a type of SDLC model in which:

- a. Each loop of the spiral represents a phase of the software process. (0.5)
- b. There are no fixed phases in this model, they vary from project to project. (0.5)

Any one of the following quadrants:

- Objective Setting (First Quadrant):
 - Identify objectives of the phase,
 - Examine the risks associated with these objectives.
 - Find alternate solutions possible.
- Risk Assessment and Reduction (Second Quadrant):
 - For each project, detailed risk analysis is carried out.
 - Steps are taken to reduce the risk.
- Development and Validation (Third quadrant):
 - Develop and validate the next level of the product.
- Review and Planning (Fourth quadrant):
 - review the results achieved so far with the customer and plan the next iteration around the spiral.

Question 3:

The major problems are: (1+1)

- a. Classical waterfall model is idealistic:
 - i. assumes that no defect is introduced during any development activity.
 - ii. However, in practice defects do get introduced in almost every phase of the life cycle.
- b. Defects usually get detected much later in the life cycle.
For example, a design defect might go unnoticed till the coding or testing phase

Question 4:

Lifecycle models are followed in software projects to provide a structured and organized approach to software development. These models define a set of activities and phases that software development teams follow in order to design, develop, test, and deploy software products. Some of the key reasons why lifecycle models are followed in software projects include:

- a. Improved project planning
- b. Better communication
- c. Higher quality software
- d. Improved project management

Overall, lifecycle models provide a structured approach to software development that can help development teams to deliver higher quality software products, more efficiently and effectively.

(OR)

A software project will never succeed if activities are not coordinated:

One engineer starts writing code, another concentrates on writing the test document first, yet another engineer first defines the file structure and another defines the I/O for his portion first. Adherence can lead to accurate status reports. Otherwise, it becomes very difficult to track the progress of the project and the project manager would have to depend on the guesses of the team members.

Question 5:

Agile requirements are **the functional and non-functional needs** of a product or service that are gathered and prioritized in an **iterative and collaborative manner**. Agile requirements emphasize **adaptability and flexibility**, enabling teams to respond quickly to changing needs and **feedback** throughout the development process.

Question 6:

Any 2 of the below differences:

(1+1)

Programs	Software Products
Usually small in size	Usually large in size
Lower development time	Longer development time
Easier to maintain	Harder to maintain
Author himself is sole user	Large number of users
Single developer	Multiple developers
Lacks proper UI	Well-designed UI

Lacks proper documentation	Well-documented
Ad hoc development	Systematic Development

Question 7:

Any 2 of the following: (or any other reasonable/relevant answer)

- Changing requirements: Agile software development is all about flexibility and adaptability to change.
- Communication: Agile modeling requires effective communication among team members.
- User involvement: Agile modeling requires user involvement, which can be challenging in some cases. Users may have difficulty articulating their requirements or may not have time to participate in modeling activities.
- Balancing detail and simplicity: Agile modeling requires finding the right balance between detailed models that capture all relevant information and simple models that are easy to understand and use.
- Technical complexity: Some software systems can be highly complex, making it challenging to create accurate and effective models. Agile modeling requires expertise in both software development and modeling, which can be a challenge for some teams.
- Handling time constraints, costs, and dependencies

Question 8:

- Custom (1)
For a specific customer
- Generic (1)
COTS (Commercial Off The Shelf)
- Embedded (1)
Build into Hardware

Question 9:

Possible Users:

- Sports channels / presenters
- Badminton enthusiasts
- Badminton coaches
- Badminton players
- Sports analytics services

Question 10:

Voice (your brand's personality) and tone (how you apply that personality based on the user's mood or context).

Question 11:

Refer "Class Reading (Mar 30)"

(https://courses.iiit.ac.in/pluginfile.php/157583/mod_resource/content/1/paper_Top%2010%20UX%20Design%20Principles%20for%20Creating%20Successful%20Products%20and%20Experiences.pdf)

Brief Idea of the 10 principles:

1. Deeply understand your users' needs, motivations, and experiences.
 - a. Analytics
 - b. Interviews and surveys
 - c. Empathy mapping
2. Tell emotional stories with your data.
 - a. Anecdotes
 - b. User stories
3. Organize information to help users easily find and do what they need.
 - a. Core modeling
 - b. Mobile-first prioritization
4. Create a consistent, authentic voice and tone.
 - a. Card sort for voice
 - b. Consider the context for tone
5. Provide a consistent experience through design systems.
6. Create inclusive experiences.
7. Prioritize usability testing.
 - a. Qualitative usability testing
 - b. Quantitative usability testing
8. Set clear UX goals and benchmarks for success.
 - a. Step 1: Clarify the goals, strategy, and logistics for usability testing.
 - b. Step 2: Value user outcomes as much as business outcomes.
 - c. Step 3: Embrace iterative measurement and optimization.
9. Go beyond the digital experience.
10. Show the work of UX to show the value of UX.

Question 12:

Project Specific:

4 marks for each sprint. Each sprint should be described by the backlog for the sprint.

Backlog is the list of all items that were planned for that sprint. Each item should have a short, single-line description.

(The backlog for a sprint is basically what they had planned to finish in that sprint at the beginning of the sprint. So whatever they scoped out at the start of the sprint.)

Total marks: 16 → **Truncate** to 15 (i.e. final marks = min(15, awarded marks))