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Examination: Final

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and Software Engineering

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Sign and date: Rakaiya  
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Answer to Question 2.(A)

The Waterfall Model was the first <sup>project</sup> process model to be introduced. Here, each phase must be completed before the next phase can begin, so there is no overlapping in the phases. In this approach, the whole process of the software development is divided into separate phases. The outcome of one phase acts as an input for the next phase sequentially. This means that any phase in the development process begins only if the previous one is completed.

There are six phases in Waterfall Model. They are:

1. Requirements: In this phase, we need to know, what to design, what we have to develop, its processes, what will be its functionality etc. It provides input material to the product being made, and thus the upcoming product is studied, marked and finalized. It also gives us the extension to decide the hardware or the software requirements of the product which will be designed, developed and captured in all ~~not~~ phases.

2. System Design: The requirement specifications from the above phase are studied in this phase and the system design is prepared. This helps in specifying hardware and software requirements and ~~help~~ helps in defining the overall system architecture.

3. Implementation: With the inputs from system design, the system is first developed in small programs called units which are integrated into the next phase. Each unit is developed and tested for its functionality which is referred to as unit testing.

Sign: Rakaiyer

4. Integration and Testing: All the units developed in the ~~develop~~ implementation phase are integrated into a system after testing of each unit. After integration, the whole system is tested for errors.

5. Development of the system: Once the non-functional, functional, alpha and beta testing are done, the product of software is deployed to the users. The development phase includes installation, migration and support for the complete system to the user.

6. Maintenance: During maintenance, the team ensures that the application is running smoothly of the server without any downtime. The issues that are faced and reported are fixed and tested again.

Some of the problem faced with Waterfall Model and their probable solutions are discussed below:

Problem 01: People blindly follow plans

In traditional methods, people pay more attention to how things will happen during the right moment without being mindful if things are really falling into place.

Solution: While planning is important it is also important that the developers and quality checkers, how things should happen, especially with the client or end user. It is important that they can immediately say how a particular step in project fulfillment can fall apart without having to wait for the testing phase.

Problem 02: Sequential process and changes become costly.

This Model does not allow for the change of defined requirements as the project progresses. Therefore, it might be possible that the end results are not satisfactory to the user.

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Solution: It is inadequate as developers cannot just go back and change something in the previous phase as the ~~req.~~ requirements change. But they ~~ever~~ has to go back to where it needs to be changed and start all over.

Problem 03: End-users are not sure of their requirements.

Most of the time the end-users mind is constantly changing and they have a vague idea of the software that they want.

Solution: It is important to involve the client in every step of the way, to make sure they understand what is going on. The client must be presented with elaborated and detailed version ~~or maps of~~ the blueprint of the software they ~~wants~~ wants to be developed. A ~~too~~ thorough and clear communication needs to be developed between the team and the client.

Problem 04: testing for quality may suffer.

It is impossible to predict accurately the outcome of a project, when the entire time is pressed for time.

Solution: It is possible to cut the testing stage short in order to meet the deadline.

An real life example for this model may be like making coffee.

- Requirement: find out the need of making coffee.
- System Design: Making of coffee in various phases, following the sequential order.
- Implementation: Finally how we are making coffee which can be in units like boiling of water, putting sugar and coffee and then milk separately.

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• Integration and testing: Here, all the ingredients are <sup>were</sup> put together which ~~are~~ in the above phase are in units and finally it is ~~to~~ tested for sugar and such.

• Deployment: The coffee is served to the specific customers.

• Maintenance: Coffee is preserved, for further use. ~~The~~ It is also inquired if ~~they~~ everything is okay or not, or ~~do~~ they ~~the~~ need more sugar, milk etc.

Waterfall Model is same as making of coffee, because we can not ~~be~~ revert back as the process has begun.

Ans to Q 2.(B)

Maik Theile	
Responsibilities	Collaborations
iTunes ID	iTunes Store
Credit	Library
Purchase	
Download in a library	
Debit an account	

Sign: Rukaiya

Answer to 2 (c)

Regression testing is the re-execution of some subset of tests that have already been conducted to ensure that changes have not propagated unintended side effects. It helps to ensure that changes do not introduce unintended behaviours or addition of errors. This may be conducted manually, by re-executing a subset of all test cases or using automated capture/playback tools.

Example of regression testing:

- (a) Bug regression: Issues and problems that are said to have been fixed are retested specifically.
- (b) Old fix method: Here, issues and bugs previously left with are all retested to be sure those areas remain intact. This was the original idea behind regression.

~~(e) CO~~

Answer to 1(B)

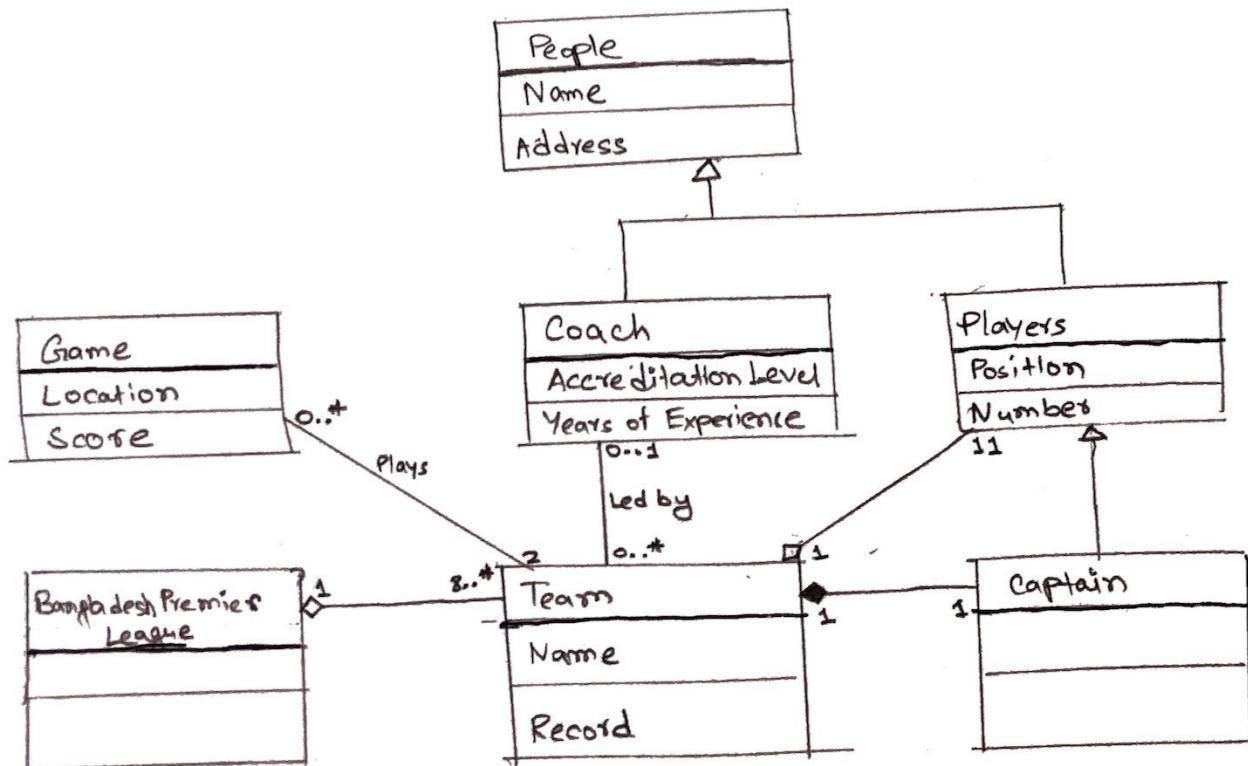
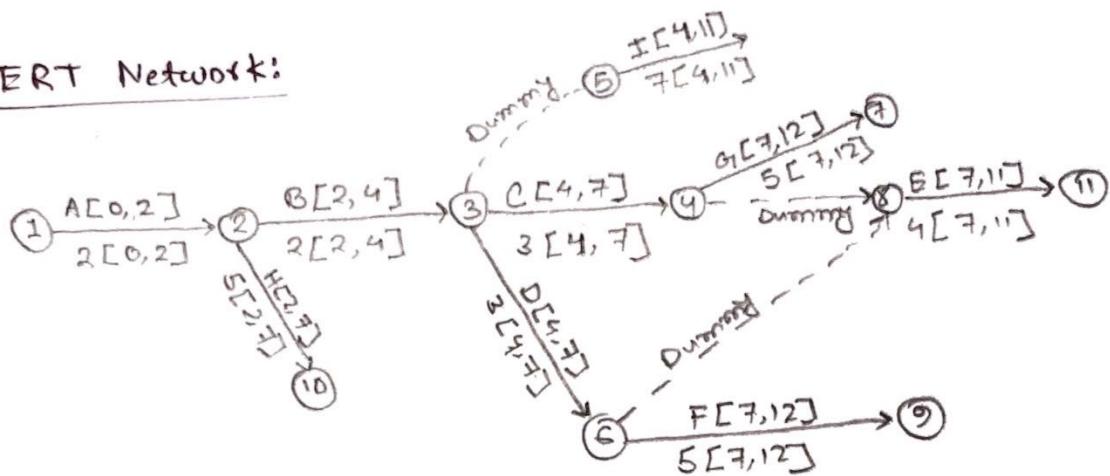


fig: UML Class diagram.

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Answer to 3(A)

PERT Network:



We needed 3 dummy activities, because we know that no 3 real time activities can start or end from a node at a time. To solve this, we needed dummy activities.

Activity Schedule:

Activity	ES	LS	EF	LF	Slack LS-ES	Critical Path
A	0	0	2	2	0	Yes
B	2	2	4	4	0	Yes
C	4	4	7	7	0	Yes
D	4	4	7	7	0	Yes
E	7	7	11	11	0	Yes
F	7	7	12	12	0	Yes
G	7	7	12	12	0	Yes
H	2	2	7	7	0	Yes
I	4	4	11	11	0	Yes

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Grantt Chart:

Activity	Completion time (weeks)	Duration (Weeks)											
		0	1	2	3	4	5	6	7	8	9	10	11
A	3			↔									
B	3			↔									
C	4				↔								
D	4				↔								
E	5					↔							
F	6					↔							
G	6					↔							
H	6				↔								
I	8					↔							

Answer to 6(A)

The differences between Prototyping and Spiral Models are discussed below:

Factors	Prototyping Model	Spiral Model
Structure	It is built, tested and reworked until the customer is <del>satisfied</del> satisfied.	It is a risk driven software development process model
Cost	Cost effective, quality improvement is possible	Quality, cost effectiveness <del>etc.</del> improvement is difficult.
Customer Evaluation	Customer interaction is continuous until the final project product.	Customer interaction is absent.
Suitability	It is suitable when the customer is not completely clear about the project	It is suitable when the customer is clear about the outcome.
Alternative Name	This is referred as close ended prototyping	It is known as meta model
Risk Analysis	Does not give due emphasis on risk analysis and alternative solutions	Through risk analysis of risk and alternative solution is taken.

The formal method model is an approach to software engineering that applies discrete math mathematics. It involves modelling and analysis with ~~understanding~~ underlying mathematically precise notation. This approach uses a formal specification language to define each characteristic of the system.

A notation is formal if:

- It comes with a formal set of rules which define its syntax and semantics.

- The rules can be used to analyse expression to determine whether they are well formed or to prove properties about them.

Example: B-method is an example of formal method model that covers the whole development ~~mett~~ of life cycle. It divides the software into separate components that further represents as Abstract Met Machines. It represents system models in the form of mathematical expressions as an Abstract Notation Machine ~~ANM~~ (ANM). These are further subjected to step wise refinement and proof obligation evaluation. Also, this is a widely cited model in specific publications concerning formal method implementation.

### Ans to Q(B)

An Agile Process is driven by customer description of what is required. Scrum ~~pro~~ is a software development method originally proposed by Schwaber and Beedle in early 1990.

It consists of 3 major parts:

- 1) Roles (3 types)
- 2) Artifacts (3 types)
- 3) Events ( 5 types)

There are mainly 11 elements.

#### Roles:

1. Product Owner: customers
2. Scrum Master: one who monitors the scrum process
3. Developers: develop the product.

Artifacts:

1. Product Backlog: an ordered list that is to be used in product.
2. Sprint Backlog: set of product backlog items selected for current sprint.
3. Increment: sum of Product Backlog completed up to this sprint.

Events:

1. Sprint: a time box with which a releasable increment is created.
2. Sprint planning: the work that is to be performed in a sprint.
3. Daily Scrum: it is a 15-minute time based event for the development team.
4. Sprint Review: inspection.
5. Sprint Retrospective: an opportunity for the Scrum team to inspect itself and create a plan for improvements to be enacted the next sprint.

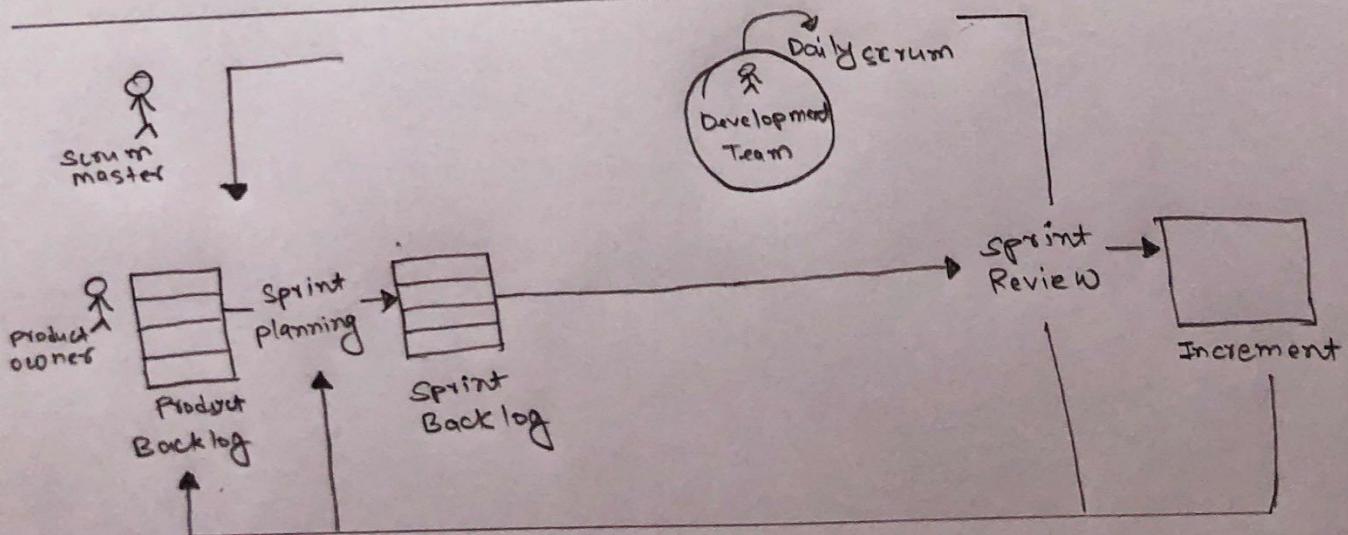


fig: Scrum framework.

Ans to 6(c)

Software testing is the process of exercising a program with the intent of finding ~~less~~ errors prior to the delivery to the end user.

Validation and Verification:

- Verification refers to the set of tasks that ensure that the software correctly implements a specific function.
- Validation refers to a different set of tasks that ensure that the software that has been built is traceable to customer requirements.

Boehm [Boe 81] states this another way:

- Verification: "Are we building the product right?"
- Validation: "Are we building the right product?"

They both ask different question to the software at test.

Answer to 3(a)

The given interview structure follows the diamond structure. This is because the questions are first asked are closed questions, then it asked more open ended questions and finally again asked closed ended questions. Also the structure began in a very specific way to examine general issues, and then concluded with specific answer.

Now, rearranging the given question.

- 1) what kind of documents do I require to open a bank account?
- 2) How can I add nominee to my account?

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- 3) How long will it take to get my check book?
- 4) How can I apply for a loan?
- 5) What loan am I eligible for?
- 6) What are the charges of the debit card?
- 7) Can I send money overseas through your bank?
- 8) How do I repay the bank?
- 9) How can I operate my account?
- 10) Could you explain your online banking system?

After rearranging, the structure is now ~~the~~ pyramid. Because it began with very, closed question and expanded by allowing open ended questions and more generalised responses. The intention was to warm up the interview to the topic by starting with closed questions and working towards open-ended ones.

### Answer to 3(B)

Differences between Alpha and beta testing are given below:

<u>Alpha testing</u>	<u>Beta testing</u>
(1) It is conducted at the developer's site by a representative of end users	It is conducted at one or more end of user sites
(2) During testing developer is present	Generally, the developer is absent.
(3) No variation of alpha testing is performed.	A variation, called customer acceptance testing, is sometimes performed.

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9) Reliability and security are not checked

5) Requires a testing or lab environment

6) May require long execution cycles.

7) It is the phase of testing where quality is ensured before forwarding it to beta testing.

8) An example: When a company like IBM launches the new operating system in the market they apply alpha testing on the software. The team consists of high level developers to test the software.

Reliability, security and robustness are checked

Do not require a lab.

Requires only a few weeks of execution.

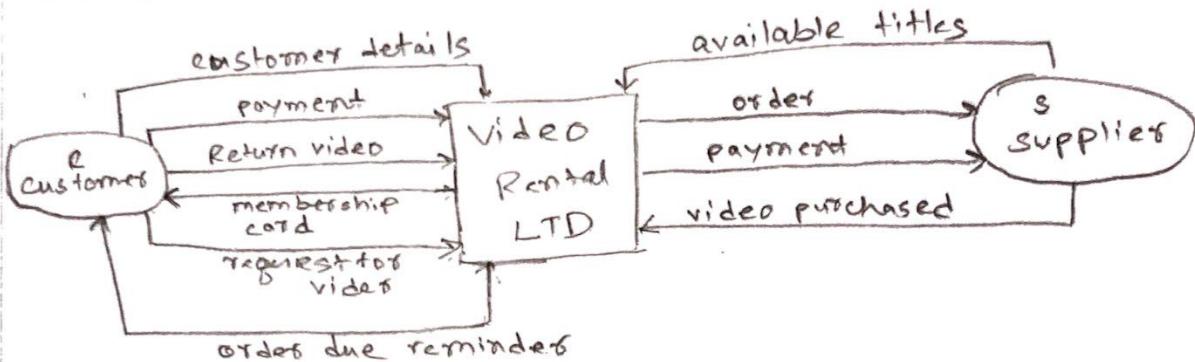
It concentrates on the quality as well but it also collects the user's input on the product and ensures that it is ready for real time users.

An example: Microsoft conducted the largest of all beta tests for its OS, Windows 8 before officially releasing it. Technical beta testing products is released to a group of people to collect their feedbacks.

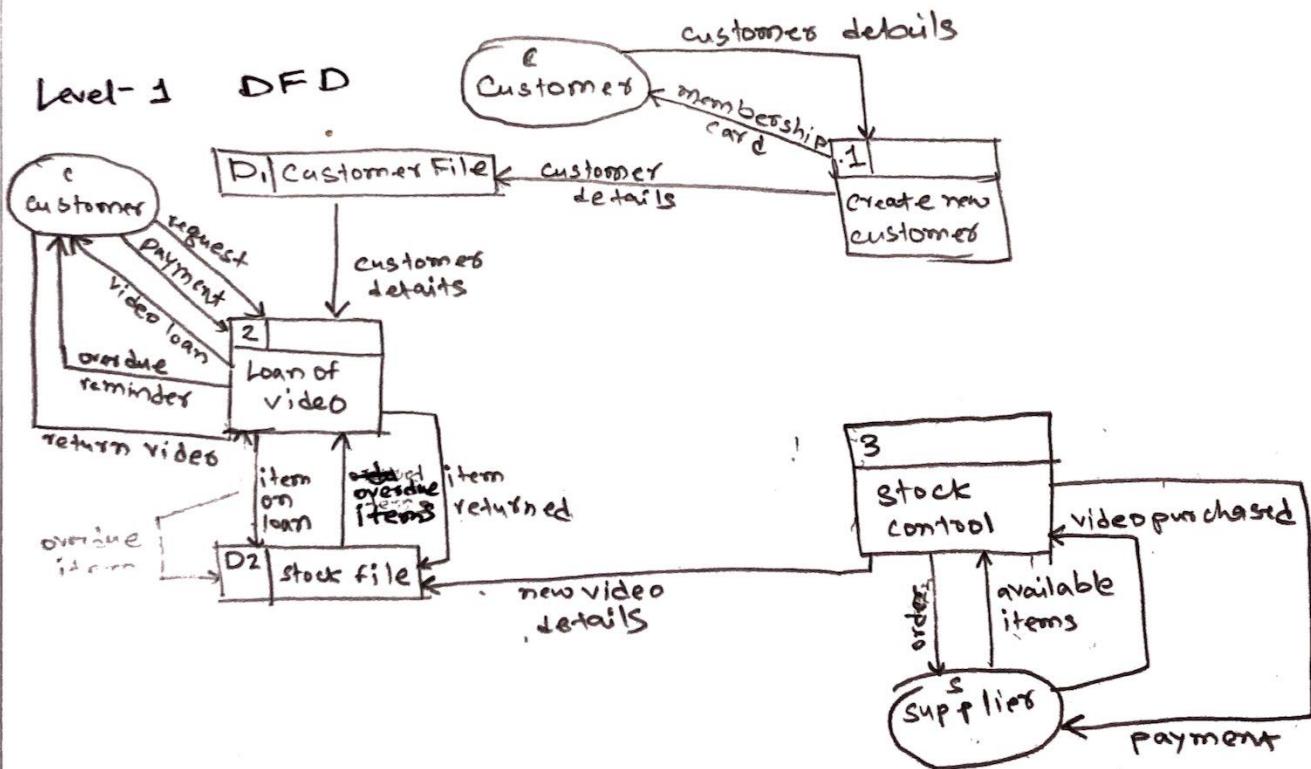
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Answer to 7 (A)

Context level DFD:



Level-1 DFD



Answer to T(B)

- (i) Tangible cost
- (ii) Intangible cost
- (iii) Intangible cost
- (iv) Tangible cost.