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(I.) Scrum project Backlog: prioritization and Tracking product Backlog Tasks:

1. User story 1:

"As a user, I want to log in securely so that I can access my account."

Task 1.1: Design login page UI.

Task 1.2: Implement secure password validation (e.g. hashing)

Task 1.3: Create a user authentication API.

Task 1.4: Test login functionality.

2. User story 2:

"As a user, I want to search for products by category to find items easily."

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Task 2.1 : Design product search page UI

Task 2.2 : Implement search filters by category.

Task 2.3 : Optimize database queries for search

Task 2.4 : Test product search functionality.

prioritization During Sprint planning:

i. Value to the customer

ii. Technical feasibility

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Ans: 2

Managing High-Risk project with Evolving Requirements Methodologies comparison:

1. Spiral:
   i. Focus on risk analysis at every cycle.
   ii. Iterative prototyping aligns with evolving requirements.

2. Agile:
   i. Frequent iterations and customer feedback ensure adaptability
   ii. Risk is managed incrementally

3 Extreme programming (XP):

i. Emphasizes continuous feedback and incremental delivery.

ii. Suitable for projects with rapidly changing requirements.

In There Agile is most suitable for high-risk, evolving project due to flexibility and customer collaration

- combine Agile with Spiral for risk-heavy components.

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Ans: 3

Methodology suitability for project A & B Methodology Analysis:

1 Waterfall:

→ Best for well-defined requirement (Project-A)

→ Lack flexibility fo project B

2. Agile:

→ Ideal for evolving requirements (project B)

→ Frequent deliveries suit feed back loops.

3. Extreme programming (XP):

Support rapid changes; Suitable for innovative project B.

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4. Spiral:

Risk analysis makes it viable for both project but complex for strict deadlines.

I will prefer:

project A → waterfall for predictability

project B → Agile or XP for adaptability

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Ans: 4

Software Engineering Ethics principles:

→ public interest, quality and integrity

→ avoid harm, ensure privacy and security.

ACM/IEEE code Ethics:

→ promote societal well-being

→ maintain professional competence

→ Uphold ethical responsibility in decision-making.

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Ans: 5

Requirements for Airport Reservation System Functional:

1. Book flights
2. Manage customer accounts.
3. process payments.
4. Generate itineraries
5. Track flight schedules

Non-Functional:

1. High availability (24/7)
2. Secure transactions.
3. Fast response time. (<1 sec)

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4. User-friendly interface.
5. Scalable for global use.

Ans:6

V-Model of testing in plan-Driven software process. The v-model is a structured software development approach where testing phrase are directly linked to corresponding development activities. The model follows a v-model follows a v-model structure with development phase on the left and testing phases on the right

Illustration of the v-model:

Requirment Analysis → Acceptance testing

System Design → System testing

Architectural Design → Integration testing

Model Design → Unit testing

coding (Implementation)

Ans: 7

prototype Software Development.

Stages:

1. Requirements gathering
2. Quick design
3. Build prototype
4. User evaluation
5. Refine prototype

Benefits:

→ Improves requirements clarity

→ Reduces risks

→ Encourage feedback.

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Ans: 8

Process Improvement cycle in Software Engineering.

This cycle helps make software development better and more efficient.

It has these steps:

1 Check the process - Find problems in the current process

2. plan changes - Decide how to improve it

3. Apply change - use the new process in real works

4. Track progress - Measure if it's working well

5. Improve more - keep making it better.

Common process metrics:

These help track and improve software work:

→ Defect count - Number of bugs found.

→ Work speed - Time taken to finish a task.

→ Team productivity - Amount of work done in a sprint.

→ Delivery Time - Time from request to final product.

→ Effort Accuracy - Difference between planned and actual effort.

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Ans: 9

SEI Capability Maturity Model (CMM)

CMM helps organizations improve Software development. It has five levels of Maturity:

1. Level 1 - Initial → No process, chaotic work.

2. Level 2 - Repeatable → Basic project management

3. Level 3 - Defined → Standardized processes.

4. Level 4 - Managed → Measured and controlled.

5. Level 5 - Optimizing → Continuous improvement

It helps to :

→ Reduces risks and failures.

→ Improves product quality.

→ Increase team efficiency.

→ Makes software development more predictable

Ans: 10

Agile Software Development core principles:

→ Customer collaboration
→ Working software fast
→ Flexibility & adaptability
→ Continuous improvement
→ Strong teamwork.

Usage in Different Environment:

Startups → fast changes. quick delivery
Large companies → Small agile team
Regulated Industries → Adjusted for compliance.

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Benefits:

→ Faster delivery
→ Better teamwork
→ Higher customer satisfaction.

Challenges:

→ Hard for big projects
→ Needs frequent customer input
→ Difficult in strict ~~ev~~ environments

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Ans: 11

Extreme programming (XP) Release cycle:

The xp release cycle follows these key stages:

2. ~~Exploration~~ - prioritize features planning and estimate effort.

1. Exploration - Gather requirements and create user stories.

3. Iterations - Develop in small cycles

4. Release - Deliver working software frequently

5. Maintenance - Fix issues and enhance features.

6. Death = End project on transition to new development.

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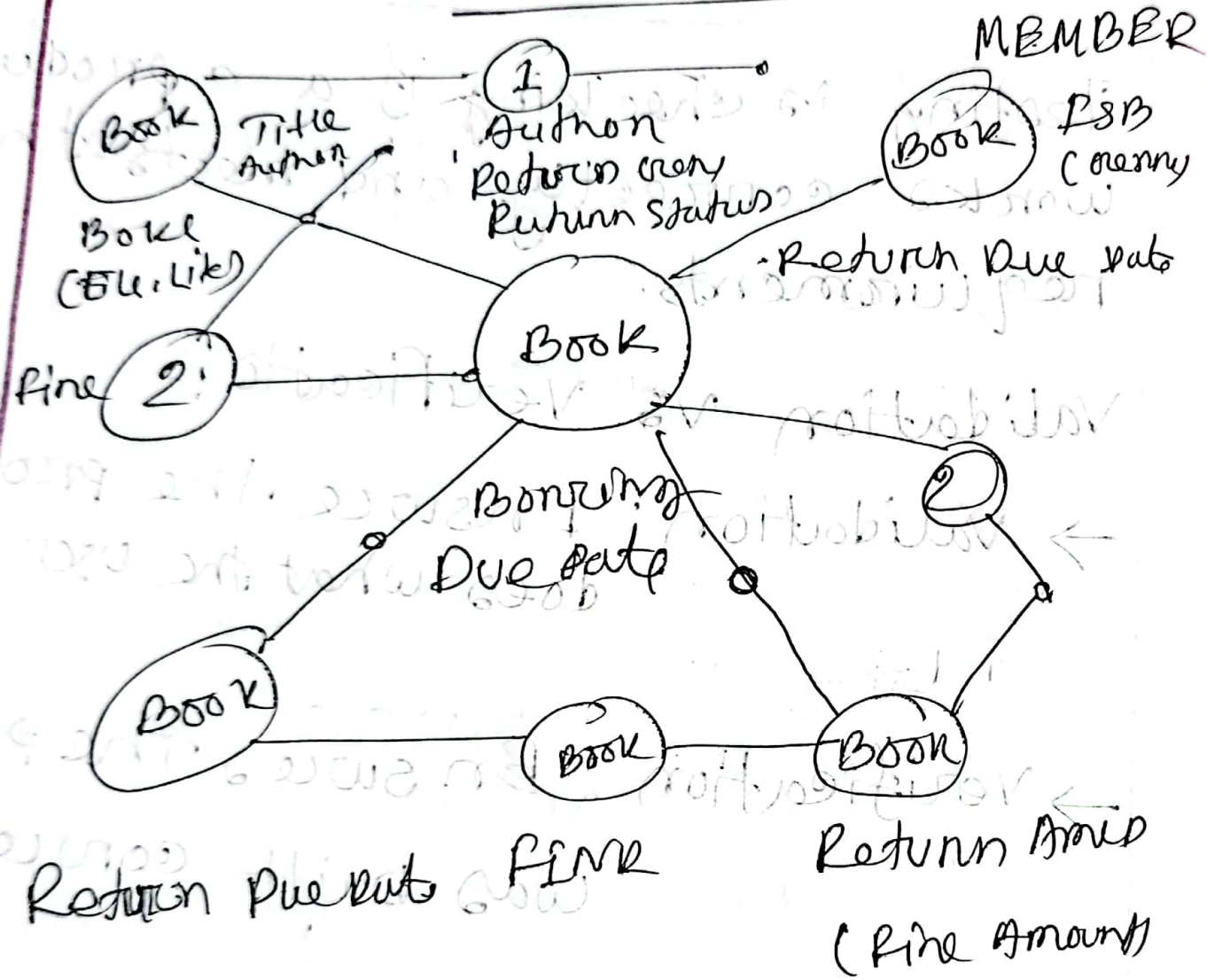
Ans: 12



Here is the Entity-Relationship Diagram (ERD) for the digital Library management system. It shows the entities like Book, Member, Borrowing and Fine. along with their.

Ans: 13

Testing is checking if a a product works correctly and meets the requirements.

Validation vs verification:

→ Validation: Ensure the product does what the user needs.

→ verification: Ensures the product was built correctly

In simple terms, validation asks "Is this what the user wanted?" and verification asks "Is this built right?".

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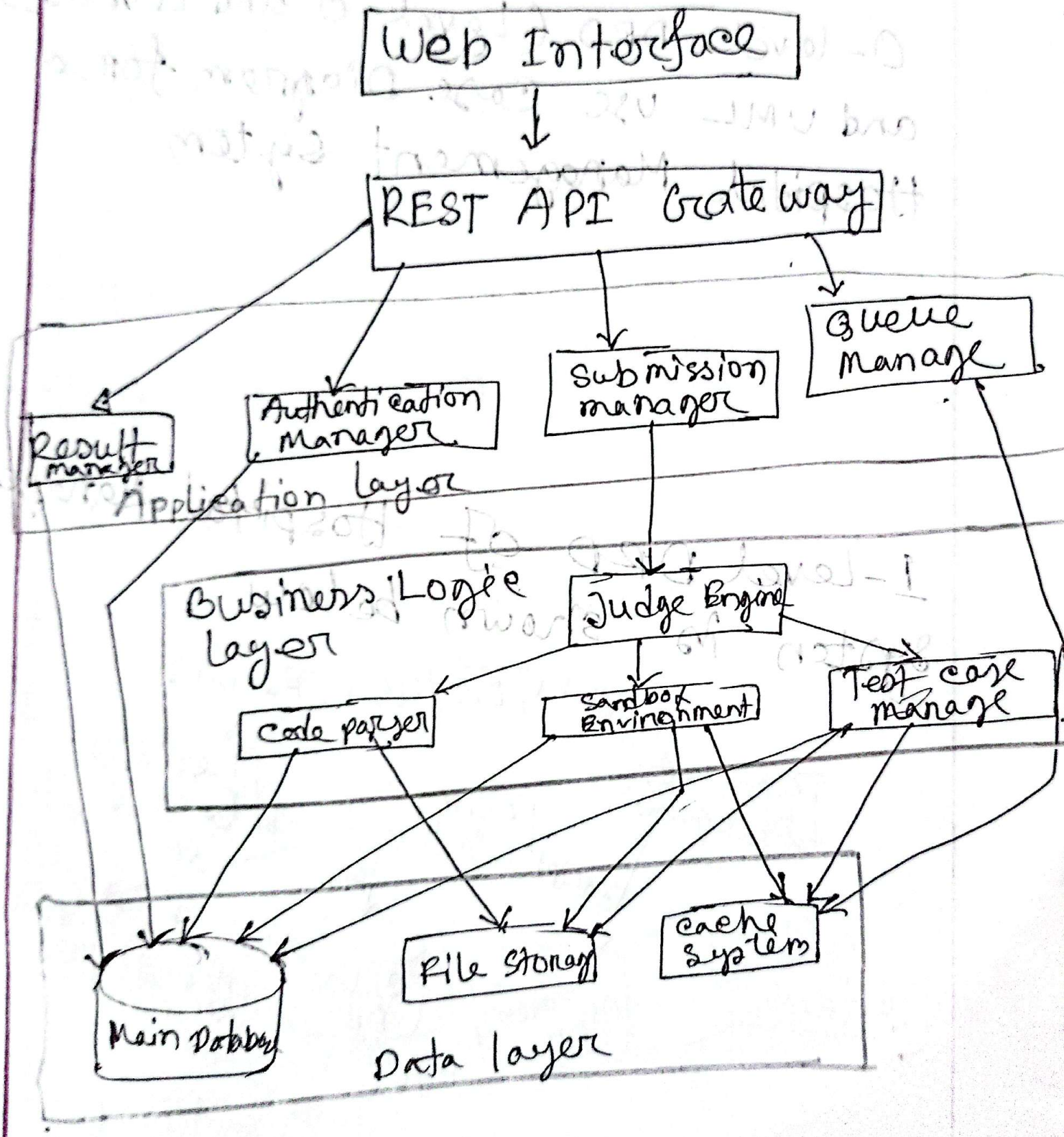
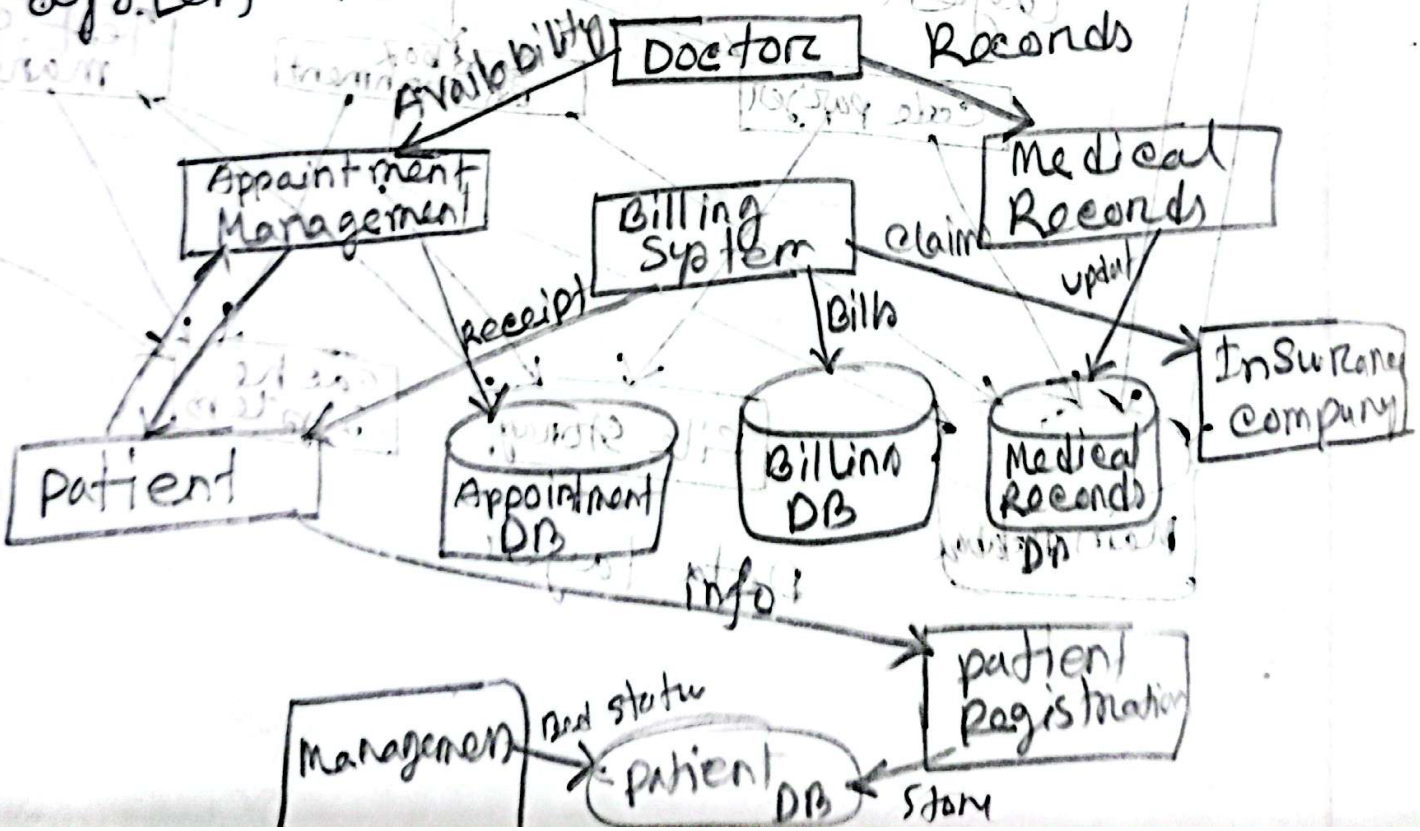
Ans: 14


Web Interface
REST API Gateway
Result manager
Authentication Manager
Submission manager
Queue manage
Application layer
Business Logic layer
Judge Engine
Code parser
Sandbox Environment
Test case manage
Main Database
File Storage
Cache System
Data layer

Ans : 15

0-level DFD (Level-0 and Level-1) and UML use case Diagram for a Hospital Management system

1-Level DFD of Hospital Management system is shown below.



Ans: 16

UML class Diagram (Based on Sequence Diagram)

Main class:

1. Student
   - userID, password
   - login(), viewClassList()

2. Login Screen
   - validateUser(userID, password)
   - displayClassList()

3. validate user
   - checkCredentials(userID, password)
   - fetchClassList()

4. Database
   - findUser(userID)
   - getClassList(userID)

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Relationships:

- Student → Login Screen (Association)
- LoginScreen → ValidateUser (call validation)
- ValidateUser → DataBase (Fetches data)

Ans: 17

Q.A (Quality Assurance): process-oriented, prevents defects by improving processes.

QC (Quality Control): product-oriented ~~pr~~ detects defects in the final product

Differences:

→ QA: proactive, ensure quality in processes.

→ QC: Reactive, finds defects in the product

Impediments:

QA: Lack of process standardization

QC: Limited testing tools or time.

Ans: ~~to~~ 18.

The role of Quality Assurance (QA) in each phase of the software Development Life Cycle (SDLC) can be

1. Requirement Analysis: Ensure clear, testable requirements.

2. Design: Reviews design to prevent defects.

3. Implementation: prepare test cases as code is written.

4. Testing: Executes Tests to find and report bugs.

5. Deployment: Verifies software is stable and ready.

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6. Maintanance: Monitors post-release ensuring no new bugs.

Ans - 19

Rapid Application Development (RAD) is a fast software development model that uses prototyping and user feedback.

Key phase:

1. Requirement planning: Define requirements.

2. User Design: create and refine prototypes.

3. Construction: Develop iteratively

4. Cutover: Deploy final product

principle:

→ Quick prototyping, active user involvement iterative development.

Advantages:

→ Faster delivery, better user feedback, flexibility for changes.

RAD speeds up development by focusing on prototypes and continuous user input while ensuring quality.

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Ans: 20

White Box Testing with JUnit (Java):

```
import org.junit.Test;
import static org.junit.Assert.*;
public class DecisionTest{
public String process(int x, int y){
if (y==0) return "y is zero";
else if(x==0) return "x is zero";
StringBuilder output = new StringBuilder();
for (int i=1; i≤x; i++){
if (i%y==0) output.append(i).append(" ");
}
return output.toString().trim();
}
@test
public void testYIsZero(){
assertEquals("x is zero", process(0,3));
}
```

```
@Test
public void testXIszero(){
assertEquals("x is zero", process(0,3));}
@Test
public void testDivisibleNumbers(){
assertEquals("2 4", process(4,2)),
}
```

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Ans: 21

To write JUnit 4 tests for your production code with Exception, setup and Timeout Rule. ~~follow~~

```
import org.junit.Before;
import org.junit.Test;
import Static org.junit.Assert.*;
public class Mytest{
private Myclass myclass;

public void Setup(){
myclass = new Myclass();
}
public void testException(){
myclass.methodThatThrowsException();

}
public void testTimeout(){
myclass.timeConsumingMethod();
}
```

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```
public void testFunctionality() {
assertEquals(4, myclass.add(2,2));
}
```