Question 1(a) [3 marks]

What is Scrum model? Write about it.

Answer:

Scrum is an **agile framework** for managing software development projects through iterative and incremental practices.

Aspect	Description
Framework Type	Agile methodology
Sprint Duration	2-4 weeks typically
Team Size	5-9 members
Key Ceremonies	Daily standups, Sprint planning, Sprint review, Retrospective

Key Features:

- **Product Owner**: Defines requirements and priorities
- **Scrum Master**: Facilitates process and removes obstacles
- **Development Team**: Cross-functional team building the product

Mnemonic: "SPIR" - Sprint, Product owner, Incremental delivery, Review

Question 1(b) [4 marks]

Define Software and Explain Software Characteristics.

Answer:

Software Definition: A collection of computer programs, procedures, and documentation that performs tasks on a computer system.

Characteristic	Description
Intangible	Cannot be touched physically
No Physical Wear	Doesn't deteriorate with time
Custom Built	Developed for specific requirements
Expensive	High development and maintenance costs

Key Points:

- **Logical Product**: Made of instructions and data
- **Engineered**: Follows systematic development process

- **Complex**: Handles multiple interconnected functions
- **Maintainable**: Can be modified and updated

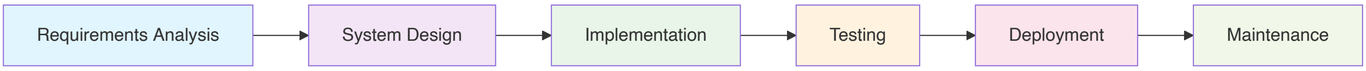
Mnemonic: "IELM" - Intangible, Engineered, Logical, Maintainable

Question 1(c) [7 marks]

Explain Waterfall Model with diagram.

Answer:

The **Waterfall Model** is a linear sequential software development approach where each phase must be completed before the next begins.



Phase	Activities	Output
Requirements	Gather and document needs	SRS Document
Design	System architecture planning	Design specs
Implementation	Actual coding	Source code
Testing	Verification and validation	Test reports
Deployment	Installation at client site	Working system
Maintenance	Bug fixes and updates	Updated system

Advantages:

- **Simple to understand** and implement
- **Well-documented** phases
- **Easy project management** with clear milestones

Disadvantages:

- **No flexibility** for requirement changes
- **Late testing** discovery of issues
- **Not suitable** for complex projects

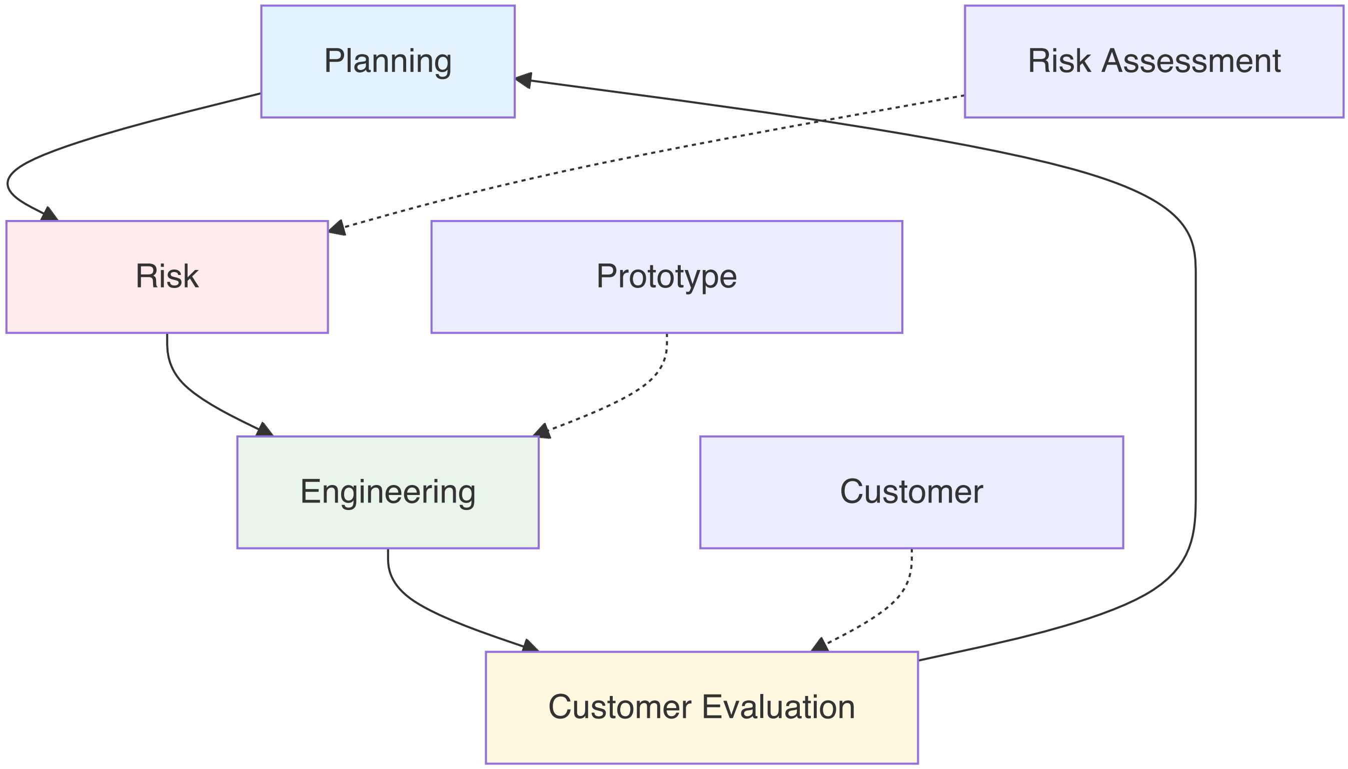
Mnemonic: "RSITDM" - Requirements, System design, Implementation, Testing, Deployment, Maintenance

Question 1(c) OR [7 marks]

Explain Spiral Model with diagram.

Answer:

The **Spiral Model** combines iterative development with systematic risk assessment, emphasizing risk analysis in each iteration.



Quadrant	Activity	Purpose
Planning	Requirement gathering	Define objectives
Risk Analysis	Identify and resolve risks	Minimize uncertainties
Engineering	Development and testing	Build working software
Evaluation	Customer assessment	Get feedback for next iteration

Key Features:

- **Risk-driven approach** with early risk identification
- **Iterative development** with customer involvement
- **Prototyping** in each spiral
- **Suitable for large** and complex projects

Advantages:

- **Early risk detection** and mitigation
- **Customer involvement** throughout development
- **Flexible** to accommodate changes

Disadvantages:

- **Complex management** due to risk analysis
- **Expensive** for small projects
- **Requires expertise** in risk assessment

Mnemonic: "PRICE" - Planning, Risk analysis, Iterative, Customer evaluation, Engineering

Question 2(a) [3 marks]

In which situation prototype model is used?

Answer:

The **Prototype Model** is used when requirements are unclear or when demonstrating feasibility is crucial.

Situation	Application
Unclear Requirements	When user needs are not well-defined
New Technology	Testing feasibility of new tools/platforms
User Interface	Designing complex UI/UX systems
High Risk Projects	Reducing uncertainties early

Specific Use Cases:

- **Web applications** with complex user interactions
- **Real-time systems** requiring performance validation
- **AI/ML projects** with experimental algorithms

Mnemonic: "UNIT" - Unclear requirements, New technology, Interface design, Testing feasibility

Question 2(b) [4 marks]

Explain requirement gathering in detail.

Answer:

Requirement Gathering is the process of collecting, analyzing, and documenting software requirements from stakeholders.

Technique	Description	When to Use
Interviews	One-on-one discussions	Detailed requirements
Questionnaires	Structured surveys	Large user groups
Observation	Watching current processes	Understanding workflows
Workshops	Group sessions	Collaborative requirements

Process Steps:

- **Stakeholder Identification**: Find all relevant parties
- **Information Collection**: Use various gathering techniques
- **Analysis**: Prioritize and categorize requirements
- **Documentation**: Create formal requirement specifications

Challenges:

- **Changing requirements** during development
- **Communication gaps** between stakeholders
- **Incomplete information** from users

Mnemonic: "IQOW" - Interviews, Questionnaires, Observation, Workshops

Question 2(c) [7 marks]

Discuss the responsibilities of software project manager.

Answer:

A **Software Project Manager** oversees the entire software development lifecycle ensuring successful project delivery.

Responsibility Area	Key Tasks	Skills Required
Planning	Project scheduling, resource allocation	Strategic thinking
Team Management	Team coordination, motivation	Leadership
Risk Management	Risk identification, mitigation strategies	Problem-solving
Communication	Stakeholder coordination, reporting	Communication skills
Quality Assurance	Process compliance, deliverable quality	Attention to detail

Detailed Responsibilities:

Project Planning:

- **Work Breakdown Structure** creation
- **Timeline estimation** and scheduling
- **Resource allocation** and budget management

Team Leadership:

- **Team building** and motivation
- **Conflict resolution** between team members
- **Performance monitoring** and feedback

Stakeholder Management:

- **Client communication** and expectation management
- **Progress reporting** to senior management
- **Change request** handling and approval

Risk and Quality Management:

- **Risk assessment** and contingency planning
- **Quality standards** enforcement
- **Process improvement** implementation

Essential Skills:

- **Technical knowledge** of software development
- **Project management** methodologies (Agile, Waterfall)
- **Communication skills** for diverse stakeholders
- **Problem-solving** and decision-making abilities

Mnemonic: "PLACE" - Planning, Leadership, Assessment, Communication, Execution

Question 2(a) OR [3 marks]

Difference between GANTT chart and PERT chart.

Answer:

Aspect	GANTT Chart	PERT Chart
Purpose	Visual timeline of tasks	Network analysis of dependencies
Format	Horizontal bar chart	Network diagram with nodes
Time Focus	Shows duration and dates	Shows critical path and slack time
Complexity	Simple to understand	More complex analysis
Best For	Project scheduling	Time optimization

Key Differences:

- **GANTT**: Shows **when tasks happen**
- **PERT**: Shows **task relationships** and critical path

Mnemonic: "GT vs PT" - Gantt Timeline vs PERT dependencies

Question 2(b) OR [4 marks]

Give the Full Form of: RAD, SDLC, XP model and SRS.

Answer:

Acronym	Full Form	Description
RAD	Rapid Application Development	Fast prototyping methodology
SDLC	Software Development Life Cycle	Complete development process
XP	Extreme Programming	Agile development methodology
SRS	Software Requirement Specification	Formal requirement document

Brief Explanations:

- **RAD**: Focuses on **rapid prototyping** and iterative development
- **SDLC**: **Systematic approach** to software development phases
- **XP**: **Agile methodology** emphasizing coding practices
- **SRS**: **Detailed documentation** of functional and non-functional requirements

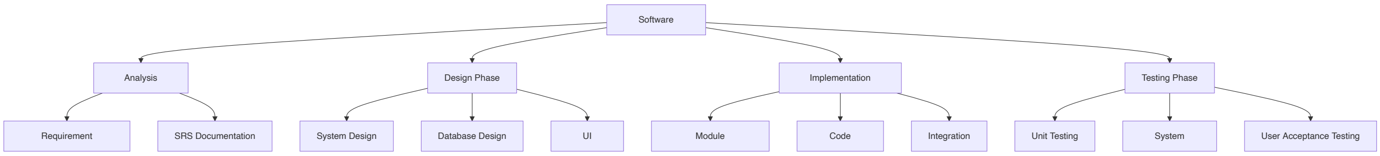
Mnemonic: "RSXS" - RAD, SDLC, XP, SRS

Question 2(c) OR [7 marks]

Explain WBS in Detail.

Answer:

Work Breakdown Structure (WBS) is a hierarchical decomposition of project work into smaller, manageable components.



WBS Level	Description	Example
Level 1	Major project phases	Analysis, Design, Implementation
Level 2	Major deliverables	SRS, Design docs, Code modules
Level 3	Work packages	Specific tasks and activities
Level 4	Individual activities	Detailed task breakdown

Benefits of WBS:

- **Clear project scope** definition
- **Better estimation** of time and resources
- **Improved task assignment** and accountability
- **Enhanced progress tracking** and control

WBS Creation Process:

- **Identify major deliverables** from project scope
- **Decompose deliverables** into smaller components
- **Continue breakdown** until work packages are manageable
- **Assign responsibilities** for each work package

Key Principles:

- **100% Rule**: WBS includes all project work
- **Mutually Exclusive**: No overlap between components
- **Manageable Size**: Work packages should be 8-80 hours

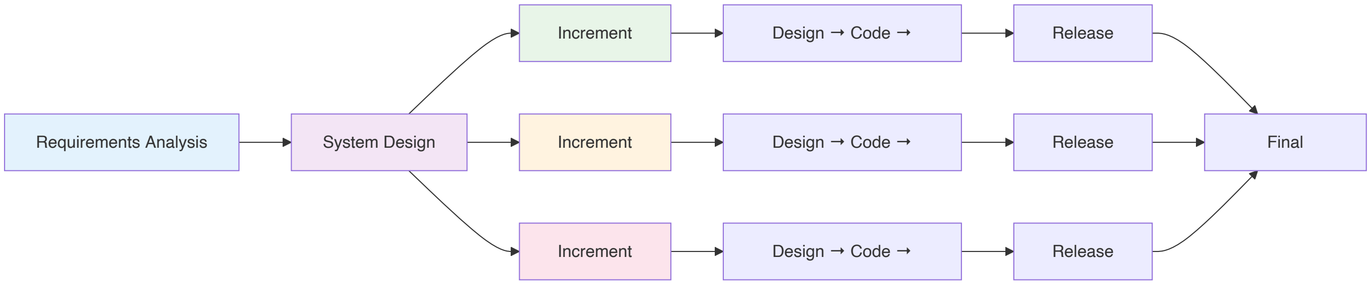
Mnemonic: "DEBT" - Decompose, Estimate, Breakdown, Track

Question 3(a) [3 marks]

Draw the diagram of Incremental Model.

Answer:

The **Incremental Model** develops software in increments, with each increment adding functionality to the previous versions.



Key Features:

- **Core functionality** delivered first
- **Additional features** added incrementally
- **Working software** available early

Mnemonic: "IRA" - Incremental, Release, Add features

Question 3(b) [4 marks]

Difference between functional and non-functional requirements

Answer:

Aspect	Functional Requirements	Non-Functional Requirements
Definition	What the system should do	How the system should perform
Focus	System behavior and features	System quality attributes
Examples	Login, data processing, reports	Performance, security, usability
Testing	Functional testing	Performance, security testing
Documentation	Use cases, user stories	Quality metrics, constraints

Detailed Comparison:

Functional Requirements:

- **User authentication** and authorization
- **Data processing** and calculations
- **Report generation** and export features
- **Business logic** implementation

Non-Functional Requirements:

- **Performance**: Response time, throughput
- **Security**: Data encryption, access control
- **Usability**: User interface design, accessibility
- **Reliability**: System availability, fault tolerance

Examples for Library System:

- **Functional**: Book search, issue/return books, fine calculation
- **Non-Functional**: Search results in <2 seconds, 99.9% uptime, SSL encryption

Mnemonic: "FW vs NH" - Functional What vs Non-functional How

Question 3(c) [7 marks]

Explain DFD with example.

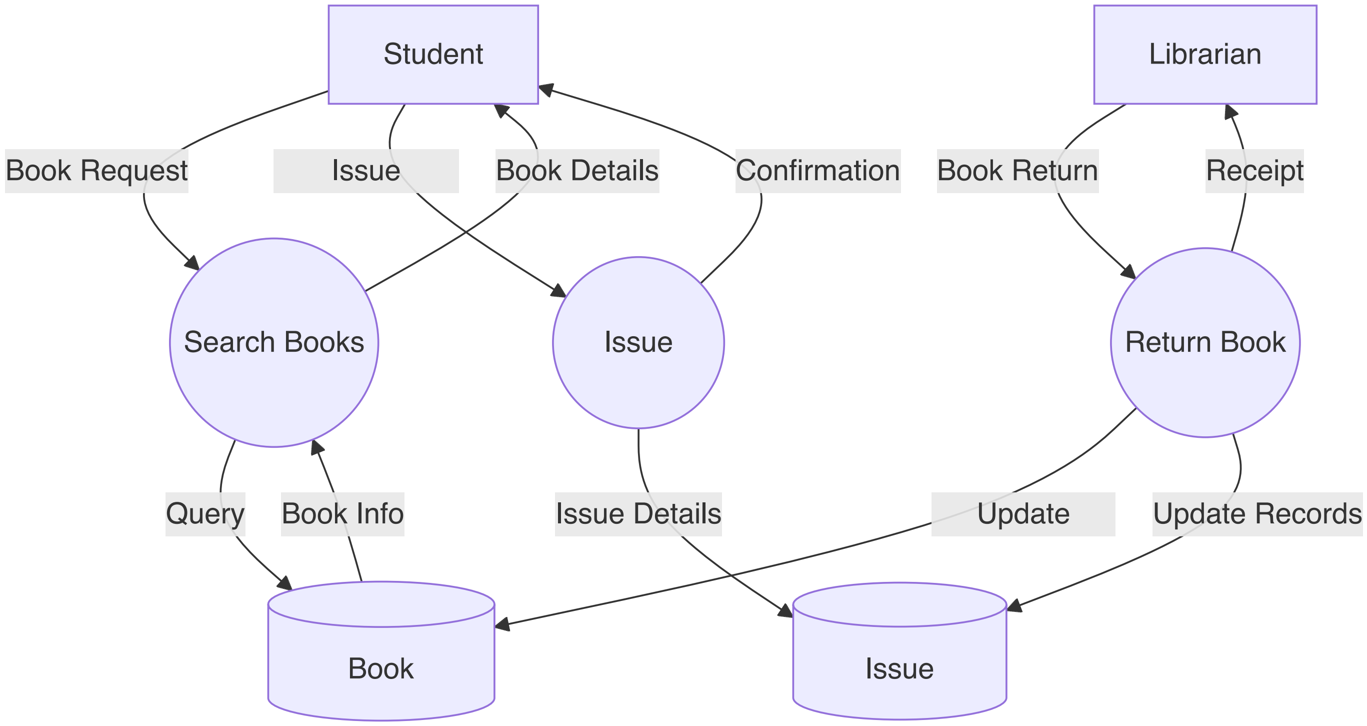
Answer:

Data Flow Diagram (DFD) is a graphical representation showing data flow through a system using processes, data stores, external entities, and data flows.

DFD Symbols:

Symbol	Name	Purpose
Circle/Oval	Process	Data transformation
Rectangle	External Entity	Data source/destination
Open Rectangle	Data Store	Data storage
Arrow	Data Flow	Data movement direction

Example: Library Management System



DFD Levels:

Context Diagram (Level 0):

- **Single process** representing entire system
- **External entities** and major data flows
- **High-level overview** of system boundaries

Level 1 DFD:

- **Major processes** of the system
- **Data stores** and their interactions
- **Detailed data flows** between processes

Level 2 and beyond:

- **Decomposition** of complex processes
- **More detailed** data transformations
- **Lower-level** process specifications

DFD Rules:

- **Process naming**: Use verb + object (e.g., "Validate User")
- **Data flow naming**: Use noun phrases (e.g., "User Details")
- **Balancing**: Input/output must match between levels
- **No direct connections** between external entities

Benefits:

- **Clear communication** with stakeholders
- **System boundary** identification
- **Process analysis** and optimization
- **Documentation** for system design

Mnemonic: "PEDS" - Process, External entity, Data store, Data flow

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Question 3(a) OR [3 marks]

Write classification of design activities.

Answer:

Design Activities are classified based on their scope and purpose in software development.

Classification	Activities	Purpose
System Design	Architecture, modules, interfaces	High-level structure
Detailed Design	Algorithms, data structures	Implementation details
Interface Design	UI/UX, API specifications	User interaction
Database Design	Schema, relationships, optimization	Data management

Key Design Activities:

- **Architectural Design**: Overall system structure
- **Component Design**: Individual module specifications
- **Data Design**: Database and file structures

Mnemonic: "ACID" - Architectural, Component, Interface, Data design

Question 3(b) OR [4 marks]

Explain characteristics of good SRS.

Answer:

A **good SRS (Software Requirement Specification)** document should possess specific characteristics for effective communication and development.

Characteristic	Description	Benefit
Complete	All requirements included	No missing functionality
Consistent	No contradictory requirements	Clear understanding
Unambiguous	Single interpretation possible	Reduced confusion
Verifiable	Requirements can be tested	Quality assurance
Modifiable	Easy to update and maintain	Adaptability
Traceable	Requirements can be tracked	Change management

Detailed Characteristics:

Completeness:

- **All functional** requirements specified
- **All non-functional** requirements included
- **All interfaces** and constraints documented

Consistency:

- **No conflicting** requirements
- **Uniform terminology** throughout document
- **Consistent formatting** and structure

Verifiability:

- **Testable requirements** with clear criteria
- **Measurable quality** attributes
- **Objective success** criteria defined

Mnemonic: "CCUMVT" - Complete, Consistent, Unambiguous, Modifiable, Verifiable, Traceable

Question 3(c) OR [7 marks]

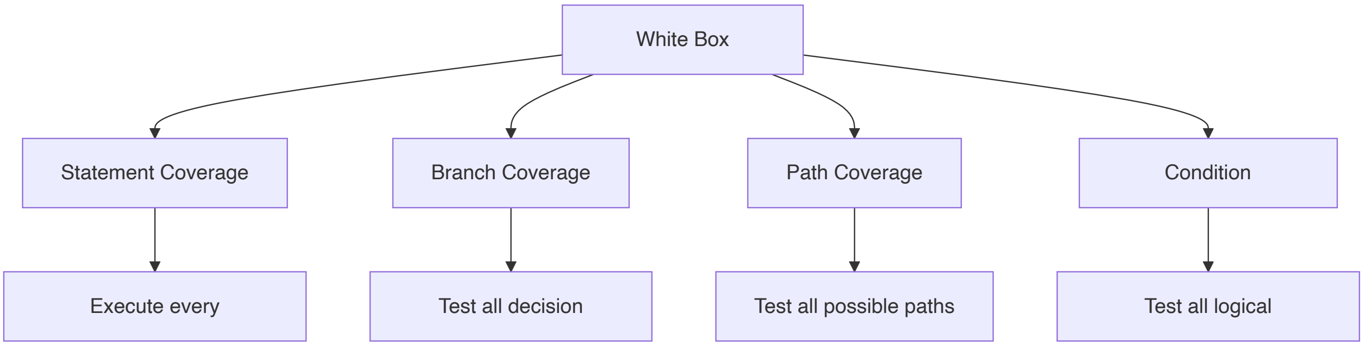
Explain White box Testing.

Answer:

White Box Testing is a testing method that examines the internal structure, code, and logic of software applications.

Aspect	Description
Also Known As	Structural testing, Glass box testing, Clear box testing
Access Level	Full access to source code and internal structure
Focus	Code coverage, logic paths, internal data structures
Tester Knowledge	Programming knowledge required

White Box Testing Techniques:



Coverage Types:

Coverage Type	Formula	Description
Statement Coverage	(Executed statements / Total statements) × 100%	Tests every line of code
Branch Coverage	(Executed branches / Total branches) × 100%	Tests all decision outcomes
Path Coverage	(Executed paths / Total paths) × 100%	Tests all execution paths
Condition Coverage	(Tested conditions / Total conditions) × 100%	Tests all logical conditions

Advantages:

- **Thorough testing** of code logic

- **Early defect detection** in development
- **Code optimization** opportunities identification
- **Complete code coverage** possible

Disadvantages:

- **Expensive and time-consuming** process
- **Requires programming skills** from testers
- **May miss** requirement-related defects
- **Complex for large** applications

Tools Used:

- **Code coverage tools** (JaCoCo, gcov)
- **Static analysis tools** (SonarQube)
- **Unit testing frameworks** (JUnit, NUnit)

Example Test Cases:

```
// Function to test
function calculateGrade(marks) {
    if (marks >= 90) return 'A';
    else if (marks >= 80) return 'B';
    else if (marks >= 70) return 'C';
    else return 'F';
}

// White box test cases for 100% branch coverage
// Test 1: marks = 95 (A grade path)
// Test 2: marks = 85 (B grade path)
// Test 3: marks = 75 (C grade path)
// Test 4: marks = 65 (F grade path)
```

Mnemonic: "SBPC" - Statement, Branch, Path, Condition coverage

Question 4(a) [3 marks]

Importance of RAD model.

Answer:

RAD (Rapid Application Development) model emphasizes quick development through prototyping and iterative design.

Importance	Benefit	Application
Fast Development	Reduced time-to-market	Business applications
User Involvement	Better requirement understanding	Interactive systems
Prototype-based	Early feedback and validation	UI-intensive applications
Component Reuse	Cost reduction and efficiency	Enterprise applications

Key Benefits:

- **Quick delivery** of working prototypes
- **Reduced development** time and costs
- **High user satisfaction** through involvement
- **Flexible to changes** during development

When to Use RAD:

- **Well-defined business** requirements
- **Experienced development** team available
- **Modular system** architecture possible

Mnemonic: "FUPR" - Fast, User involvement, Prototype-based, Reusable components

Question 4(b) [4 marks]

Explain code inspection.

Answer:

Code Inspection is a systematic examination of source code to identify defects, improve quality, and ensure compliance with standards.

Type	Description	Participants	Duration
Formal Inspection	Structured process with defined roles	3-6 people	2-4 hours
Walkthrough	Author-led review session	2-7 people	1-2 hours
Peer Review	Informal colleague review	2-3 people	30-60 minutes
Tool-based Review	Automated code analysis	Individual	Varies

Code Inspection Process:

- **Planning**: Select code, assign roles, schedule meeting
- **Overview**: Author explains code purpose and design
- **Preparation**: Reviewers study code individually

- **Inspection Meeting**: Systematic defect identification
- **Rework**: Author fixes identified issues
- **Follow-up**: Verify defect resolution

Benefits:

- **Early defect detection** before testing
- **Knowledge sharing** among team members
- **Code quality improvement** and standardization
- **Reduced maintenance** costs

Mnemonic: "FWPT" - Formal, Walkthrough, Peer review, Tool-based

---

Question 4(c) [7 marks]

Explain cohesion with its classification.

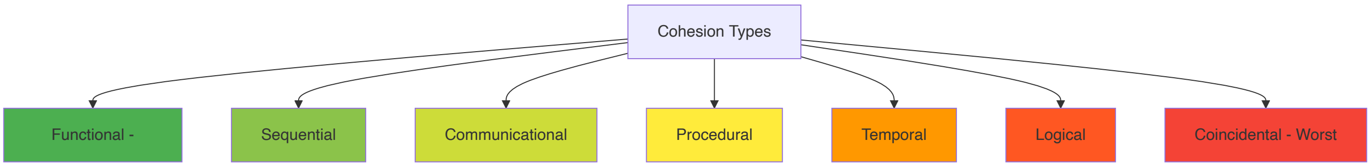
Answer:

Cohesion measures how closely related and focused the responsibilities of a single module are. Higher cohesion indicates better module design.

Cohesion Types (Ranked from Best to Worst):

Type	Description	Example	Strength
Functional	Single, well-defined task	Calculate tax amount	Highest
Sequential	Output of one element feeds next	Read→Process→Write data	High
Communicational	Elements operate on same data	Update customer record	High
Procedural	Elements follow execution sequence	Initialize→Process→Cleanup	Medium
Temporal	Elements executed at same time	System startup routines	Medium
Logical	Similar logical functions grouped	All input/output operations	Low
Coincidental	No meaningful relationship	Random utility functions	Lowest

Detailed Classification:



Functional Cohesion (Best):

- **Single responsibility** principle
- **Example**: `calculateInterest()` - only calculates interest
- **Benefits**: Easy to understand, test, and maintain

Sequential Cohesion:

- **Data flows** from one element to next
- **Example**: `readFile() → parseData() → generateReport()`
- **Good design** for processing pipelines

Communicational Cohesion:

- **Same data structure** manipulation
- **Example**: Module updating all fields of customer record
- **Reasonable design** for data-centric operations

Procedural Cohesion:

- **Control flow** relationship
- **Example**: Initialization sequence in specific order
- **Acceptable** for procedural operations

Temporal Cohesion:

- **Time-based** relationship
- **Example**: System startup or shutdown routines
- **Moderate quality** design

Logical Cohesion:

- **Similar functions** grouped together
- **Example**: All mathematical functions in one module
- **Poor design** - difficult to maintain

Coincidental Cohesion (Worst):

- **No logical relationship** between elements
- **Example**: Miscellaneous utility functions
- **Avoid this** - creates maintenance nightmares

Benefits of High Cohesion:

- **Easier maintenance** and debugging
- **Better reusability** of modules
- **Improved testability** and reliability
- **Clearer code** understanding

How to Achieve High Cohesion:

- **Single Responsibility Principle**: One reason to change
- **Clear module purpose**: Well-defined functionality

- **Minimal interfaces**: Reduce external dependencies
- **Logical grouping**: Related functions together

Mnemonic: "FSCPTLC" - Functional, Sequential, Communicational, Procedural, Temporal, Logical, Coincidental

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Question 4(a) OR [3 marks]

Software doesn't wear out.

Answer:

Software doesn't wear out means software doesn't deteriorate physically like hardware components do over time.

Aspect	Hardware	Software
Physical Degradation	Components wear out	No physical degradation
Age Effect	Performance decreases	Performance remains constant
Failure Pattern	Increasing failure rate	Constant failure rate
Maintenance	Replace worn parts	Fix logical errors only

Key Points:

- **No mechanical parts** to wear out
- **Logical errors** don't increase with time
- **Performance degradation** due to environment changes, not aging
- **Failures occur** due to design flaws, not wear

Why This Matters:

- **Different maintenance** approach needed
- **Focus on updates** rather than replacement
- **Longevity planning** differs from hardware

Mnemonic: "NLPF" - No physical parts, Logical errors, Performance constant, Failures from design

---

Question 4(b) OR [4 marks]

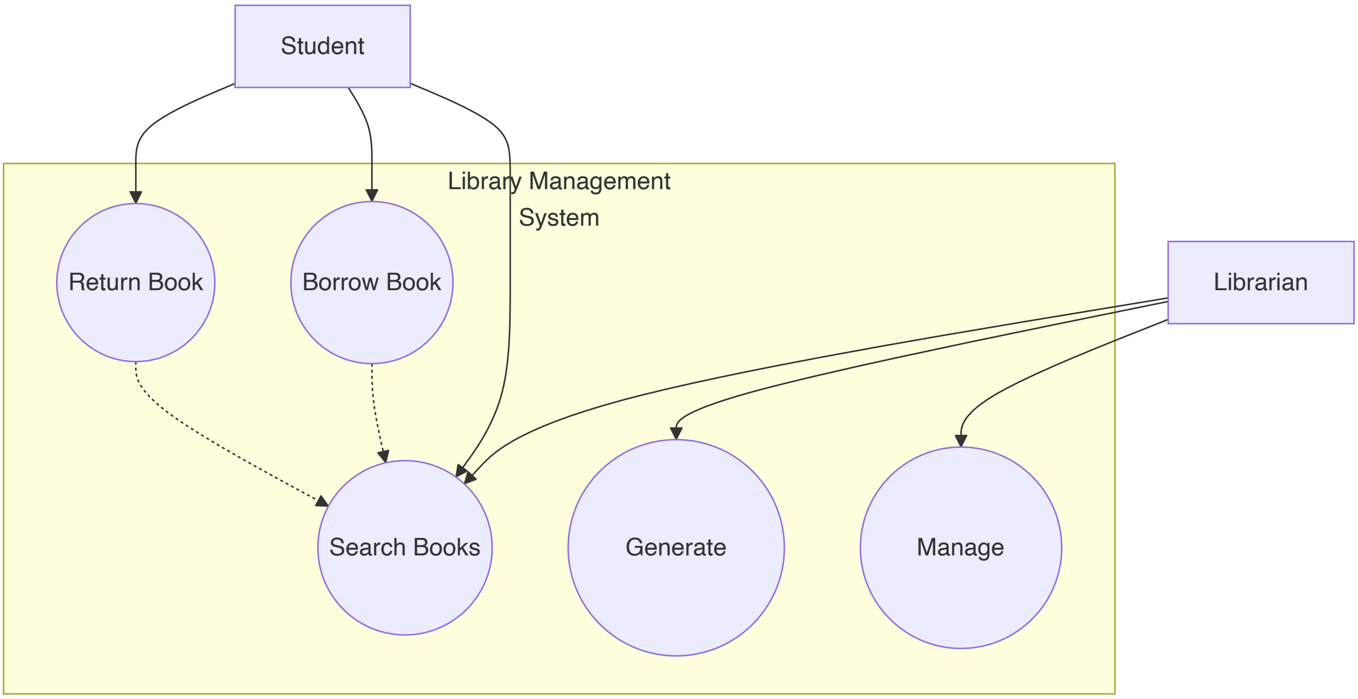
Explain use-case diagram.

Answer:

Use-case Diagram is a UML behavioral diagram showing system functionality from user's perspective through interactions between actors and use cases.

Component	Symbol	Description
Actor	Stick figure	External entity interacting with system
Use Case	Oval	System function or service
System Boundary	Rectangle	System scope definition
Relationships	Lines/Arrows	Associations between components

Use-case Diagram Elements:



Relationship Types:

- **Association**: Actor participates in use case
- **Include**: Use case always includes another use case
- **Extend**: Use case conditionally extends another
- **Generalization**: Inheritance between actors/use cases

Benefits:

- **Clear system scope** definition
- **User requirements** visualization
- **Communication tool** with stakeholders
- **Test case** derivation basis

Mnemonic: "AUSB" - Actor, Use case, System boundary, Relationships

Question 4(c) OR [7 marks]

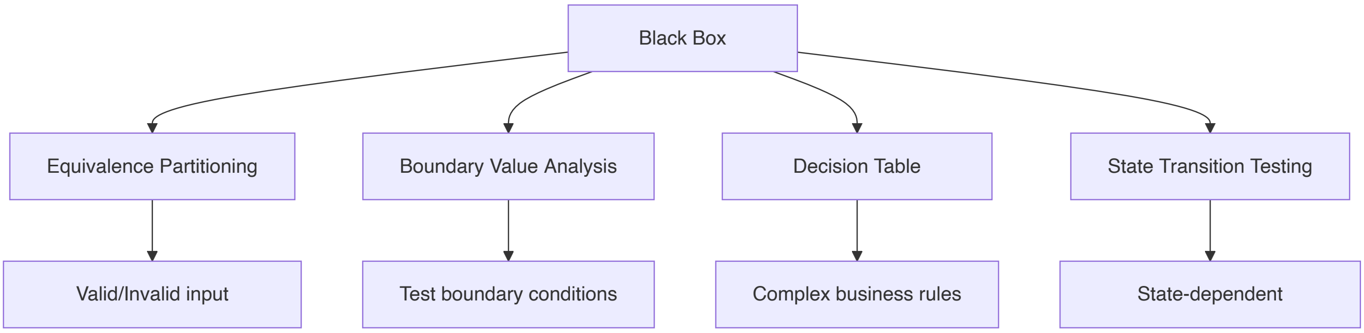
Explain Black box Testing.

Answer:

Black Box Testing is a testing method that examines software functionality without knowledge of internal code structure or implementation details.

Aspect	Description
Also Known As	Functional testing, Behavioral testing, Specification-based testing
Access Level	No access to source code or internal structure
Focus	Input-output behavior, functional requirements
Tester Knowledge	Domain knowledge required, not programming

Black Box Testing Techniques:



Testing Techniques:

Technique	Description	Example
Equivalence Partitioning	Divide inputs into valid/invalid groups	Age: 0-17, 18-60, 60+
Boundary Value Analysis	Test at boundaries of input ranges	Test at 17, 18, 60, 61
Decision Table	Test combinations of conditions	Login with valid/invalid user/password
State Transition	Test state changes	ATM states: Idle→Card inserted→PIN entry

Test Case Design Example:

```
Function: Login validation
Inputs: Username, Password
Valid equivalence classes:
- Username: 5-20 characters, alphanumeric
- Password: 8-15 characters, special chars allowed

Invalid equivalence classes:
- Username: <5 or >20 characters, special chars
- Password: <8 or >15 characters, spaces

Boundary values to test:
- Username: 4, 5, 20, 21
- Password: 7, 8, 15, 16
```

Advantages:

- **No programming knowledge** required for testers
- **User perspective** testing approach
- **Independent verification** of requirements
- **Effective for** large applications

Disadvantages:

- **Limited code coverage** visibility
- **Cannot identify** unused code paths
- **Difficult to design** test cases without specifications
- **May miss** logical errors in code

Types of Black Box Testing:

- **Functional Testing**: Feature verification
- **Integration Testing**: Module interaction testing
- **System Testing**: Complete system validation
- **Acceptance Testing**: User requirement verification

Tools Used:

- **Test management tools** (TestRail, Zephyr)
- **Automation tools** (Selenium, QTP)
- **Defect tracking tools** (Jira, Bugzilla)

When to Use:

- **Requirements-based** testing
- **User acceptance** testing
- **System integration** testing

- **Regression testing** after changes

Mnemonic: "EBDS" - Equivalence, Boundary, Decision table, State transition

Question 5(a) [3 marks]

Difference between verification and validation.

Answer:

Aspect	Verification	Validation
Definition	"Are we building the product right?"	"Are we building the right product?"
Focus	Process compliance	Product correctness
When	During development	After development
Method	Reviews, inspections, walkthroughs	Testing with actual data
Cost	Lower cost of defect detection	Higher cost of defect detection

Key Differences:

- **Verification**: Checks against **specifications**
- **Validation**: Checks against **user needs**
- **Verification**: **Static testing** methods
- **Validation**: **Dynamic testing** methods

Examples:

- **Verification**: Code review, design review, SRS review
- **Validation**: Unit testing, integration testing, system testing

Mnemonic: "VR vs VT" - Verification Reviews vs Validation Testing

Question 5(b) [4 marks]

Explain SRS.

Answer:

SRS (Software Requirement Specification) is a detailed document describing the functional and non-functional requirements of a software system.

Component	Description	Purpose
Introduction	System overview and scope	Context setting
Functional Requirements	What system should do	Feature specification
Non-functional Requirements	How system should perform	Quality attributes
Constraints	Limitations and restrictions	Boundary definition

SRS Structure:

- **System Purpose**: Why the system is needed
- **System Scope**: What the system will and won't do
- **Definitions**: Technical terms and acronyms
- **User Requirements**: High-level user needs
- **System Requirements**: Detailed technical specifications

Importance of SRS:

- **Communication tool** between stakeholders
- **Baseline for testing** and validation
- **Contract basis** between client and developer
- **Change management** reference document

Users of SRS:

- **Developers**: Implementation guidance
- **Testers**: Test case creation
- **Project Managers**: Planning and tracking
- **Clients**: Requirement verification

Mnemonic: "IFNC" - Introduction, Functional, Non-functional, Constraints

---

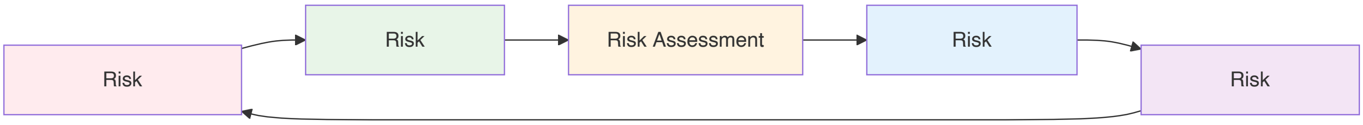
Question 5(c) [7 marks]

Explain Risk Management.

Answer:

Risk Management is the systematic process of identifying, analyzing, and responding to project risks to minimize their impact on project success.

Risk Management Process:



Phase	Activities	Output
Identification	Brainstorming, checklists, expert judgment	Risk register
Analysis	Probability and impact assessment	Risk matrix
Assessment	Risk prioritization and ranking	Risk priority list
Mitigation	Response strategy development	Mitigation plans
Monitoring	Track risks and mitigation effectiveness	Status reports

Risk Categories:

Project Risks:

- **Schedule delays** due to resource unavailability
- **Budget overruns** from scope changes
- **Team turnover** affecting productivity
- **Communication gaps** between stakeholders

Technical Risks:

- **Technology complexity** exceeding team skills
- **Integration challenges** with existing systems
- **Performance issues** under load conditions
- **Security vulnerabilities** in design

Business Risks:

- **Changing requirements** from market conditions
- **Competition** releasing similar products
- **Regulatory changes** affecting compliance
- **Stakeholder conflicts** on priorities

Risk Response Strategies:

Strategy	Description	When to Use	Example
Accept	Acknowledge risk, no action	Low impact risks	Minor UI changes
Avoid	Eliminate risk source	High impact, avoidable	Change technology
Mitigate	Reduce probability/impact	Manageable risks	Additional testing
Transfer	Shift risk to third party	Specialized risks	Insurance, outsourcing

Risk Assessment Matrix:

Probability/Impact	Low	Medium	High
High	Medium	High	Critical
Medium	Low	Medium	High
Low	Very Low	Low	Medium

Risk Mitigation Techniques:

- **Prototyping** to reduce technical uncertainty
- **Staff training** to address skill gaps
- **Regular reviews** to catch issues early
- **Contingency planning** for critical scenarios

Benefits of Risk Management:

- **Proactive problem** prevention
- **Better decision** making with risk awareness
- **Improved project** success rates
- **Stakeholder confidence** in project delivery

Risk Monitoring Activities:

- **Regular risk reviews** and updates
- **Risk trigger monitoring** for early warning
- **Mitigation plan** progress tracking
- **New risk identification** as project evolves

Tools for Risk Management:

- **Risk registers** and databases
- **Risk assessment** matrices
- **Monte Carlo** simulation for quantitative analysis
- **Expert judgment** and historical data

Key Success Factors:

- **Management commitment** to risk processes
- **Team awareness** and participation
- **Regular communication** about risks
- **Integration** with project management processes

Mnemonic: "IATMM" - Identify, Analyze, Assess, Treat, Monitor risks

Question 5(a) OR [3 marks]

List out any functional requirements for Hostel management system.

Answer:

Functional Requirements for Hostel Management System define what the system should do to manage hostel operations effectively.

Module	Functional Requirements
Student Management	Register students, assign rooms, maintain profiles
Room Management	Room allocation, availability tracking, maintenance
Fee Management	Fee calculation, payment processing, receipt generation
Visitor Management	Visitor registration, entry/exit tracking, approval

Detailed Functional Requirements:

Student Module:

- **Student registration** with personal details
- **Room assignment** based on availability
- **Student profile** management and updates

Administrative Module:

- **Staff management** and role assignment
- **Report generation** for occupancy and finances
- **Complaint management** and resolution tracking

Security Module:

- **Access control** for different user types
- **Visitor logging** and approval system
- **Emergency contact** management

Mnemonic: "SRFV" - Student, Room, Fee, Visitor management

Question 5(b) OR [4 marks]

Explain Agile process.

Answer:

Agile Process is an iterative and incremental software development approach emphasizing collaboration, flexibility, and customer satisfaction.

Agile Principle	Description	Benefit
Customer Collaboration	Continuous customer involvement	Better requirement understanding
Working Software	Deliver functional software frequently	Early value delivery
Responding to Change	Adapt to changing requirements	Market responsiveness
Individuals and Interactions	People over processes and tools	Better team dynamics

Agile Values:

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

Agile Practices:

- **Short iterations** (1-4 weeks)
- **Daily standups** for team coordination
- **Sprint planning** and review meetings
- **Continuous integration** and testing

Benefits:

- **Faster delivery** of working software
- **Better quality** through continuous testing
- **Improved stakeholder** satisfaction
- **Flexibility** to handle changes

Mnemonic: "CWRI" - Customer collaboration, Working software, Responding to change, Individuals

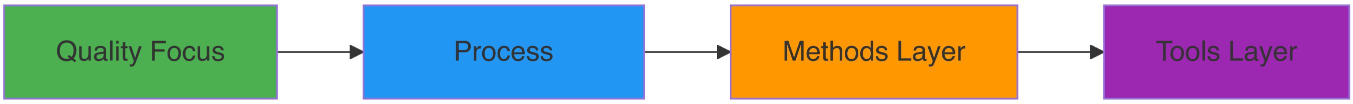
Question 5(c) OR [7 marks]

Explain Software Engineering - A layered approach

Answer:

Software Engineering - A Layered Approach represents software engineering as a structured methodology with multiple interconnected layers, each building upon the foundation of lower layers.

Layered Architecture:



Layer	Description	Purpose	Examples
Quality Focus	Foundation emphasizing quality	Ensures customer satisfaction	Quality standards, metrics
Process	Framework for software development	Provides structure and control	SDLC models, project management
Methods	Technical approaches and techniques	Guides development activities	Analysis, design, testing methods
Tools	Automated support for methods	Increases productivity	IDEs, testing tools, CASE tools

Detailed Layer Analysis:

Quality Focus (Foundation Layer):

- **Bedrock of software engineering** approach
- **Commitment to quality** in all activities
- **Customer satisfaction** as primary goal
- **Continuous improvement** mindset
- **Quality characteristics**: Correctness, reliability, efficiency, maintainability

Process Layer:

- **Defines framework** for effective delivery
- **Establishes context** for technical methods
- **Key elements**: Communication, planning, modeling, construction, deployment
- **Process models**: Waterfall, Agile, Spiral, Incremental
- **Management activities**: Project planning, tracking, risk management

Methods Layer:

- **Technical knowledge** for building software

- **Encompasses broad array** of tasks
- **Communication methods**: Requirement elicitation, analysis
- **Planning methods**: Project estimation, scheduling
- **Modeling methods**: Analysis and design techniques
- **Construction methods**: Coding standards, testing strategies
- **Deployment methods**: Delivery, support, feedback

Tools Layer:

- **Automated or semi-automated** support
- **Increases efficiency** and reduces errors
- **Tool categories**:
  - **Development environments**: IDEs, compilers
  - **Analysis and design tools**: UML tools, CASE tools
  - **Testing tools**: Unit testing, automation frameworks
  - **Project management tools**: Scheduling, tracking software

Interactions Between Layers:

Quality ↔ Process:

- Quality focus **drives process** selection
- Process **ensures quality** delivery

Process ↔ Methods:

- Process **provides context** for methods
- Methods **implement process** activities

Methods ↔ Tools:

- Methods **define what** needs to be done
- Tools **provide how** to do it efficiently

Benefits of Layered Approach:

- **Systematic methodology** for software development
- **Scalability** from small to large projects
- **Flexibility** to adapt tools and methods
- **Quality assurance** at every level
- **Risk reduction** through structured approach

Implementation Strategy:

- **Start with quality focus** establishment
- **Select appropriate process** for project context

- **Choose methods** matching process requirements
- **Integrate tools** supporting selected methods
- **Continuous evaluation** and improvement

Key Success Factors:

- **Management commitment** to quality
- **Team training** on methods and tools
- **Process adherence** and discipline
- **Tool integration** and standardization
- **Continuous improvement** culture

Real-world Application:

- **Large organizations**: Complete layer implementation
- **Small teams**: Simplified but consistent approach
- **Project-specific**: Tailored layer selection
- **Industry standards**: Compliance with quality frameworks

Mnemonic: "QPMT" - Quality focus, Process, Methods, Tools (from bottom to top)