CS403 SOFTWARE ENGINEERING (RGPV)

UNIT–1 : THE SOFTWARE PRODUCT AND SOFTWARE PROCESS

> Exam Focus: Agar tum sirf Unit-1 achhe se kar lo to 15–20 marks cover ho sakte hain. Process Models, Agile aur CMM sabse important topics hain.

UNIT OVERVIEW

Why This Unit Is Important?

Ye unit Software Engineering ki foundation hai.

Isme software kaise develop hota hai aur kaunse models use hote hain ye padhaya jata hai.

Weightage

Approx: 15–20 Marks

Most Repeated Questions

🔥 Explain Waterfall Model.

🔥 Explain Spiral Model.

🔥 Explain Agile Process.

🔥 Explain CMM Levels.

🔥 Compare SDLC Models.

🔥 Product Metrics vs Process Metrics.

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1. SOFTWARE PRODUCT ⭐⭐⭐

Simple Explanation

Software Product wo final software hota hai jo customer ko deliver kiya jata hai.

Sirf program nahi balki:

- Programs
- Documentation
- User Manuals
- Procedures

sab milkar Software Product banate hain.

Exam Definition

"A software product is a complete package consisting of programs, associated documents and operational procedures delivered to users."

Example

- WhatsApp
- Instagram
- Google Chrome
- ATM Software

Key Points

✅ Delivered to customer

✅ Solves a problem

✅ Contains documentation

Advantages

- Automates work
- Saves time
- Increases efficiency

Viva Questions

Q. What is a software product?

Ans. Collection of programs, documents and procedures delivered to users.

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2. SOFTWARE PROCESS ⭐⭐⭐⭐

Simple Explanation

Software banane ke liye follow kiye gaye steps ko Software Process kehte hain.

Definition

"A software process is a structured set of activities required to develop and maintain software."

Activities

```
Requirement Gathering
        ↓
Analysis
        ↓
Design
        ↓
Coding
        ↓
Testing
        ↓
Maintenance
```

Example

Food Delivery App

1. Requirement
2. Design
3. Coding
4. Testing
5. Deployment

SOFTWARE PRODUCT vs SOFTWARE PROCESS

Software Product	**Software Process**
Final Output	Development Method
What is built	How it is built
Customer uses it	Developers follow it
Example: WhatsApp	Example: Agile

🔥 Frequently Asked

PRODUCT CHARACTERISTICS ⭐⭐⭐

Good software should have:

1. Reliability

Correct results.

2. Efficiency

Uses fewer resources.

3. Maintainability

Easy to modify.

4. Usability

Easy to use.

5. Portability

Works on multiple platforms.

Memory Trick

REMUP

R → Reliability

E → Efficiency

M → Maintainability

U → Usability

P → Portability

PROCESS CHARACTERISTICS ⭐⭐⭐

Good process should be:

- Understandable
- Visible
- Reliable
- Maintainable
- Efficient

SOFTWARE PROCESS MODELS

⭐⭐⭐⭐⭐

Most Important Topic

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1. WATERFALL MODEL ⭐⭐⭐⭐⭐

Most Repeated

Definition

Linear sequential model where one phase must finish before next starts.

Diagram

```
Requirement
      ↓
```

```
Analysis
      ↓
Design
      ↓
Coding
      ↓
Testing
      ↓
Maintenance
```

Advantages

✅ Simple

✅ Easy to understand

✅ Proper documentation

Disadvantages

❌ No flexibility

❌ Difficult to change requirements

Used When

Requirements are fixed.

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7 Marks Question

Explain Waterfall Model with diagram.

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2. PROTOTYPING MODEL ⭐⭐⭐⭐

Concept

First create a sample version.

Customer checks it.

Then actual software is developed.

Diagram

```
Requirements
       ↓
Prototype
       ↓
Customer Feedback
       ↓
Modification
       ↓
Final Product
```

Advantages

✅ Better understanding

✅ Customer involvement

Disadvantages

❌ Cost increases

❌ Time consuming

Example

Online Shopping App Mockup

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3. RAD MODEL ⭐⭐⭐

RAD = Rapid Application Development

Purpose:

Develop software very quickly.

Features

- Fast development
- User involvement
- Reusable components

Advantages

✅ Faster delivery

✅ Less development time

Disadvantages

❌ Skilled developers needed

❌ Not suitable for large projects

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4. INCREMENTAL MODEL ⭐⭐⭐⭐⭐

Very Important

Concept

Software developed in small parts.

Example

WhatsApp

Version 1 → Chat

Version 2 → Voice Call

Version 3 → Video Call

Diagram

```
Increment 1
      ↓
Increment 2
      ↓
Increment 3
      ↓
Final System
```

Advantages

✅ Early delivery

✅ Easy testing

✅ Easy maintenance

Disadvantages

❌ Good planning required

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5. SPIRAL MODEL ⭐⭐⭐⭐⭐

Most Important

Frequently Asked

Definition

Risk-driven software development model.

Diagram

```
Planning
     ↓
Risk Analysis
     ↓
Engineering
     ↓
Evaluation
     ↓
Repeat
```

Key Feature

Risk Analysis

Advantages

✅ Excellent risk management

✅ Suitable for large projects

Disadvantages

❌ Expensive

❌ Complex

Example

Banking System

Defense Software

Exam Question

Explain Spiral Model with diagram.

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6. COMPONENT ASSEMBLY MODEL

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Concept

Software developed using reusable components.

Example

Website

Login Module

Payment Module

Notification Module

Combine all modules.

Advantages

✅ Fast development

✅ Reduced cost

Disadvantages

❌ Component compatibility issues

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7. RUP (Rational Unified Process) ⭐⭐⭐

Phases

1. Inception
2. Elaboration
3. Construction
4. Transition

Memory Trick

IECT

I → Inception

E → Elaboration

C → Construction

T → Transition

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8. AGILE PROCESS ⭐⭐⭐⭐⭐

Very Important

Expected in Exam

Definition

Agile is an iterative and incremental software development approach focusing on customer collaboration and rapid delivery.

Agile Cycle

```
Plan
  ↓
Design
  ↓
Code
  ↓
Test
  ↓
Release
  ↓
Repeat
```

Principles

- Customer involvement
- Continuous feedback
- Frequent releases
- Team collaboration

Advantages

✅ Flexible

✅ Fast delivery

✅ Better customer satisfaction

Disadvantages

❌ Less documentation

❌ Requires skilled team

Example

Facebook

Instagram

Modern Web Apps

PROCESS CUSTOMIZATION ⭐⭐⭐

Definition

Modifying software process according to project needs.

Example

Small Project

Use Agile

Large Government Project

Use Waterfall

Advantages

- Better efficiency
- Better project control

CMM (Capability Maturity Model)

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Most Important

Definition

CMM measures the maturity level of software processes.

Levels

```
Level 5 → Optimizing

Level 4 → Managed

Level 3 → Defined

Level 2 → Repeatable

Level 1 → Initial
```

Memory Trick

IRDMO

I → Initial

R → Repeatable

D → Defined

M → Managed

O → Optimizing

Level 1 Initial

No process.

Level 2 Repeatable

Basic management exists.

Level 3 Defined

Standard process defined.

Level 4 Managed

Process measured and controlled.

Level 5 Optimizing

Continuous improvement.

Exam Question

Explain all CMM levels.

PRODUCT METRICS ⭐⭐⭐

Definition

Metrics used to measure software quality.

Examples

- LOC (Lines of Code)
- Reliability
- Defect Density

PROCESS METRICS ⭐⭐⭐

Definition

Metrics used to measure development process performance.

Examples

- Cost
- Development Time
- Productivity

PRODUCT METRICS vs PROCESS METRICS

Product Metrics	Process Metrics
Measure Product	Measure Process
Quality Focus	Performance Focus
LOC	Cost
Reliability	Schedule

COMPARISON OF ALL MODELS

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Model	Flexibility	Risk Handling	Cost
Waterfall	Low	Poor	Low
Prototype	Medium	Medium	Medium
RAD	High	Medium	Medium
Incremental	High	Good	Medium
Spiral	Very High	Excellent	High
Agile	Very High	Good	Medium

MOST IMPORTANT QUESTIONS FROM UNIT-1

2 Marks

1. Define Software Product.
2. Define Software Process.
3. What is Agile?
4. What is RAD?
5. Define CMM.

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5 Marks

1. Explain Waterfall Model.
2. Explain Incremental Model.
3. Explain Product Metrics.
4. Explain Process Metrics.

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7 Marks

1. Explain Spiral Model with diagram.
2. Explain Agile Process.
3. Explain CMM Levels.
4. Explain Prototyping Model.

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10 Marks

1. Compare Software Process Models.
2. Explain SDLC Models in detail.
3. Waterfall vs Spiral Model.
4. Explain Agile methodology.

PYQ ANALYSIS (Expected 2026)

Topic	Trend	Probability
Waterfall Model	Frequently Asked	Very High
Spiral Model	Frequently Asked	Very High
Agile Process	Frequently Asked	Very High
CMM	Frequently Asked	Very High
Incremental Model	Frequently Asked	High
Product Metrics	Sometimes Asked	Medium
Process Metrics	Sometimes Asked	Medium

NIGHT BEFORE EXAM REVISION (UNIT-1)

Remember only:

✅ Waterfall = Sequential

✅ Prototype = Sample First

✅ RAD = Fast Development

✅ Incremental = Part by Part

✅ Spiral = Risk Analysis

✅ Agile = Customer Collaboration

✅ CMM Levels = IRDMO

✅ Product Metrics = Product Quality

✅ Process Metrics = Process Performance