

(Q1)

Ans The following are significance of recognizing Software requirements in software engineering process

- 1) Helps ensure that software being developed meets the need and expectation of stakeholders
- 2) Can help identify potential issue or problems early in development process allowing for adjustment to be made before significant.
- 3) Help ensure that software is developed in cost effective & efficient manner
- 4) Can improve communication and collaboration between the development team and stakeholders
- 5) Help to ensure that the software system meet the need of all stakeholders
- 6) Provide clear and unambiguous description of requirements which help to reduce misinterpretation and errors
- 7) Help to identify potential conflicts & contradiction in the requirement, which can be resolved before software development process begin
- 8) Help ensure that software system is delivered on time within budget and to the required quality standards
- 9) provide solid foundation for the development process which help to reduce the risk of failure

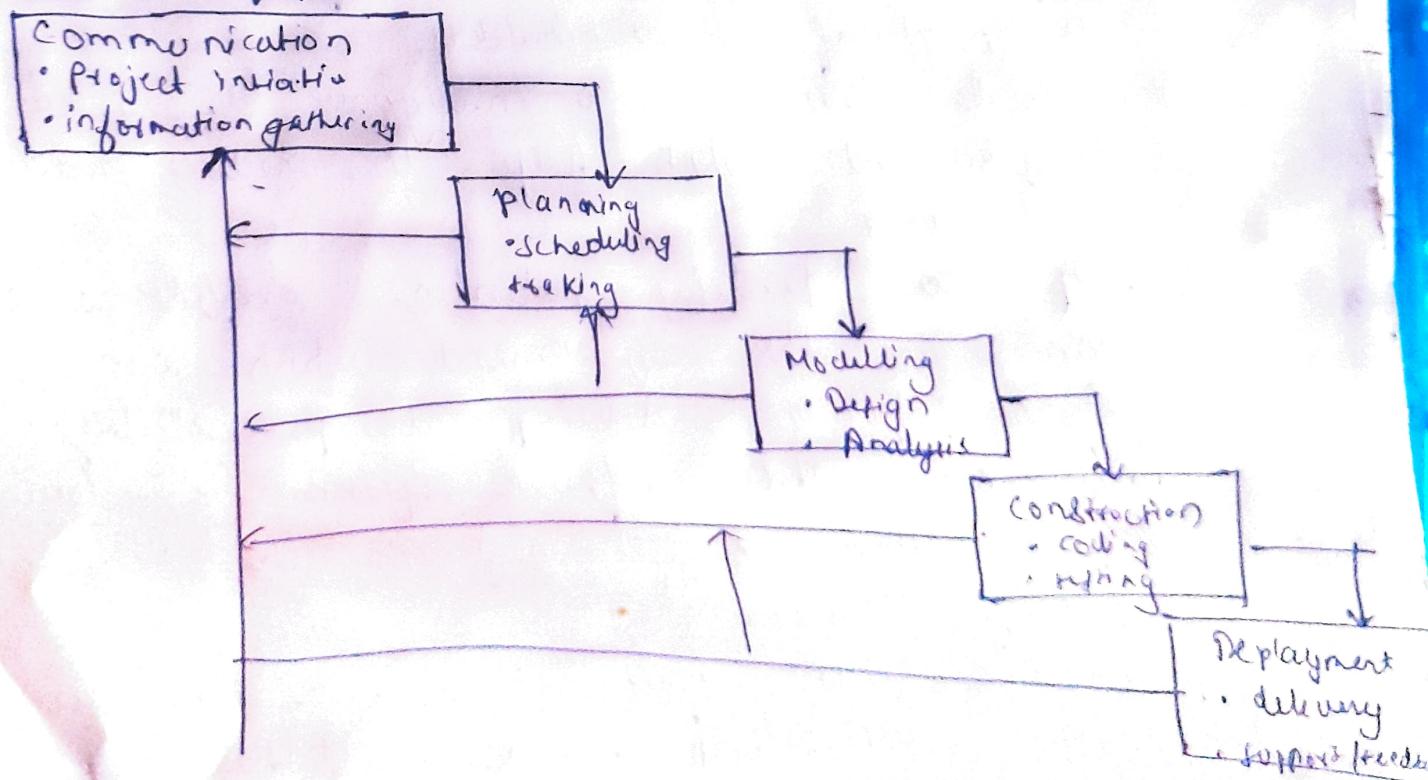
Ques 2) Ans Software process model is the abstraction of the software development process. It is a representation of the order of activities of the process and the sequence in which they are performed.

The 5 generic process framework activities:

- 1) Communication
- 2) planning
- 3) Modelling
- 4) Construction
- 5) Deployment.

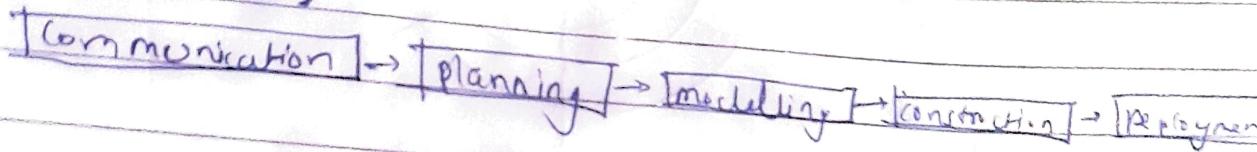
a) Waterfall model -

It is sequential, plan driven - process where you must plan and schedule all your activities before starting the project. It does not support iteration, so changes can cause confusion.



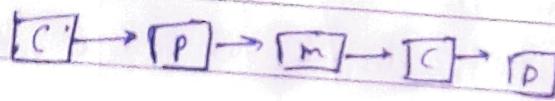
Incremental model: similar to iterative model, but software will be built in increments, each delivering specific functionalities. It is efficient as developers only focus on what is important and bugs are fixed as they arise; but you need a clear & complete definition of the whole system before you start.

Increment #1



Increment #2

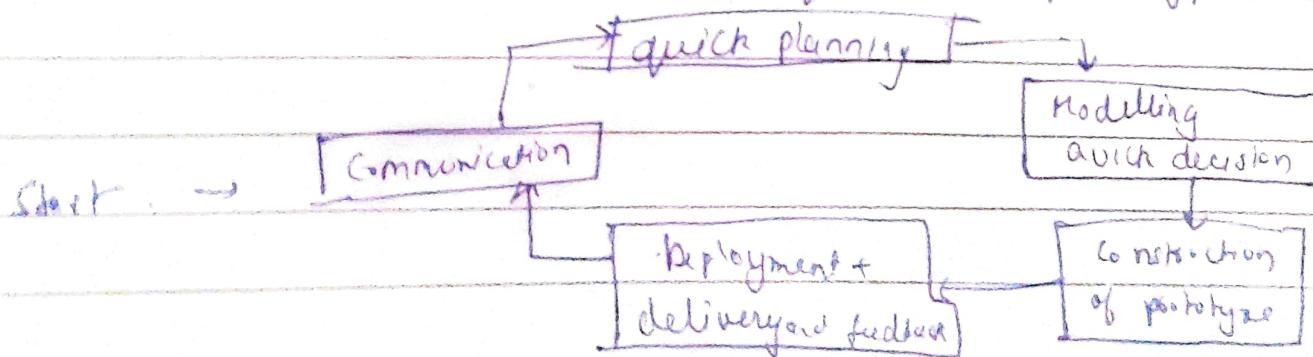
Increment #3



(c) Prototyping model:

Allows an evolutionary iterative approach used when requirements are not well understood. focuses on those aspects of software that are visible to customer/user.

Feedback is used to refine the prototype

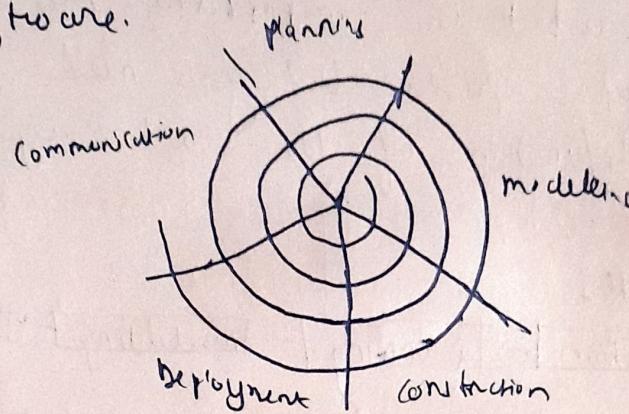


d) Spiral model.

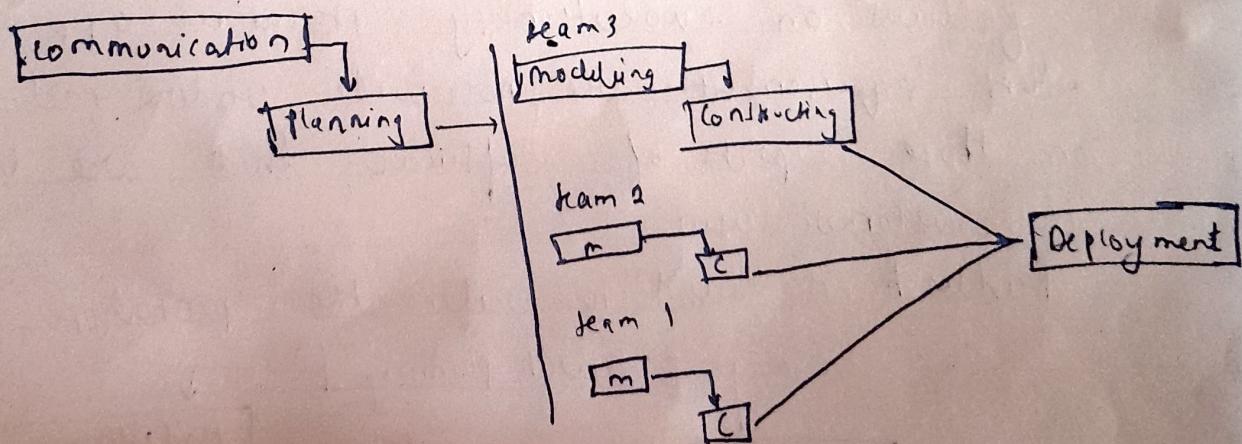
combination of waterfall and iterative prototyping follows evolutionary approach

Inner spiral focuses on identifying software requirements & project risks

Outer spiral takes on a classical waterfall approach after requirements have been defined but permits iterative growth of the software.

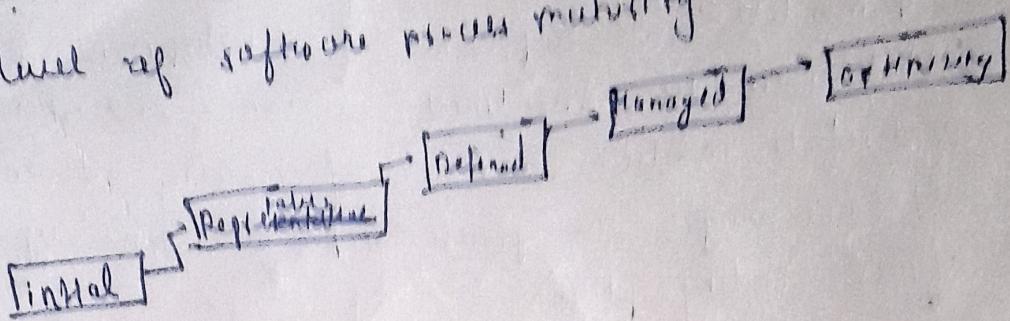


e) RAD model (Rapid Action development) using RAD model software product can be developed within a very short period of time requirements are divided into different groups are ready with their final product the product for each team is integrated form a whole product



It also provides guidelines to further enhance the maturity of the process used to develop these software products.

five level of software process maturity



Level 1: initial

few process are defined and success depends on individual efforts

level 2: repeatable

basic project management process are established to track cost, schedule and functionality.

level 3: Defined

All project use an approved, tailored version of the organization standard software process for developing & maintaining software.

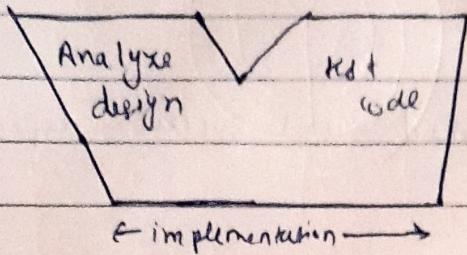
level 4: managing

Detailed measures of the software process and product quality are collected

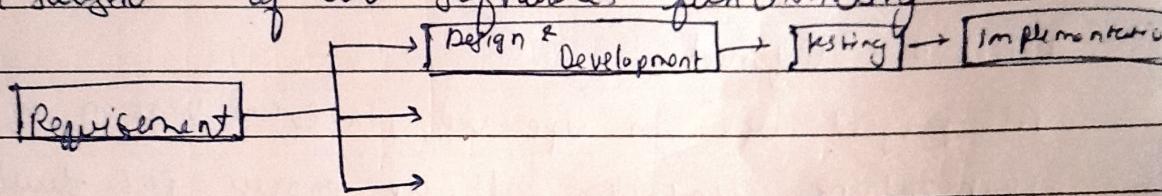
level 5: optimizing

continuous process improvement is enabled by quantitative feedback from the process and from plotting innovative ideas & technologies.

d) V-model - It represents a development process that can be considered as an extension of the waterfall model. Instead of moving down in a linear way, the process steps are now upward after coding phase.



g) Iterative model: each iteration may includes a subset of the software functionality.



(Q3)

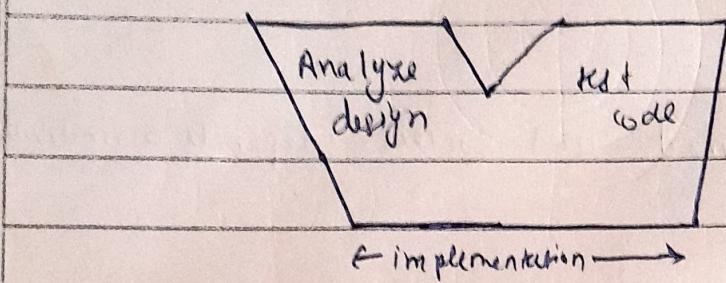
Ans CMM was developed by software engineering institute (SEI) at Carnegie Mellon University in 1987. It defines the process characteristics that should exist if an organization wants to establish a software process that is complete. The SEI CMM present 2 types of model models.

As a staged model

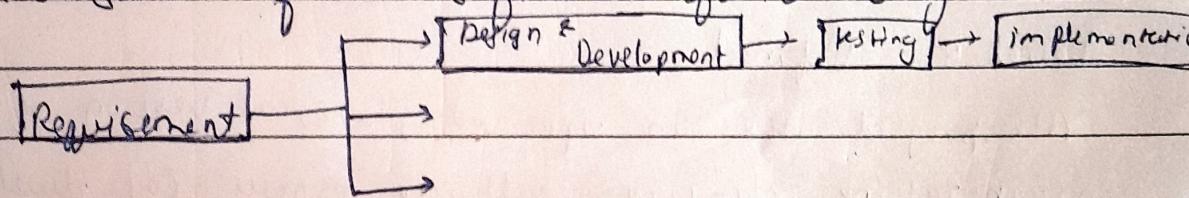
developed systems

full & complete cycle to
the duration

j) V-model - It represents a development process that can be considered as an extension of the waterfall model. Instead of moving down in a linear way, the process steps are bent upward after coding phase.

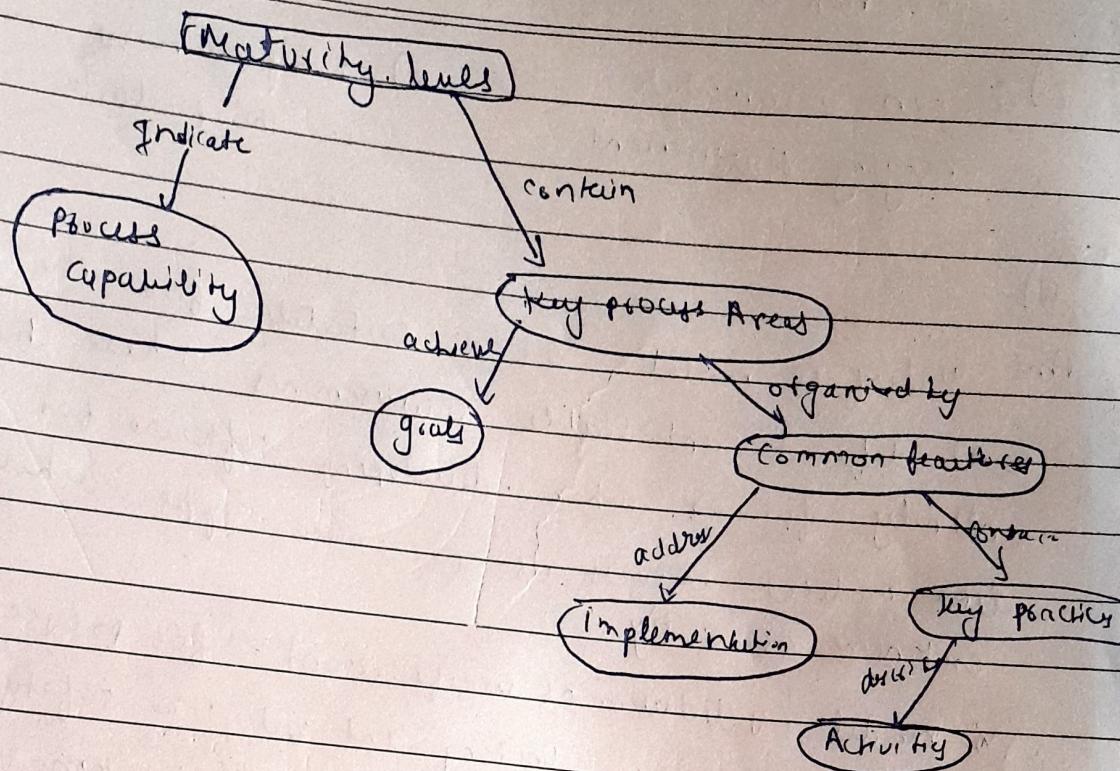


g) Iterative model: each iteration may includes a subset of the software's functionality.



(Q3)

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4)

Any Prescriptive model

Evolutionary model

- 1) Developed to bring order & structure to the software development process
- 2) Defines a distinct set of activities/actions, tools that are tailored to engineer high quality software
- 3) More popular
- 4) provide complete & well developed systems
- 1) Evolutionary software process do not establish the main speed of evolution due to the development process become slow
- 2) Evolutionary process models lack flexibility/extensibility & high quality
- 3) less popular.
- 4) Time does not allow a full & complete cycle to be done.

- Waterfall model,
incremental model
- 6) It can accommodate changing requirement
- 5)
- 6) e.g - prototyping, spiral and incremental model
- 6) Improvement is required in the product.

Ans Waterfall model - It is suitable for the project with well defined and stable requirements where changes are unlikely. for ex when developing software for critical systems like medical devices or aerospace app where change can be extensive or risky.

- a) V-model (Validation or verification) : for project that require a strong focus on testing and VU like safety system or financial software .the V-model ensure the systematic approach to verifying and validating each development phase in parallel
- b) Incremental model : when project has high risk due to full set of requirement can't be defined upfront - the incremental model work well. It is suitable for project involving e-commerce platforms where features can be developed and delivered in stages.
- c) RAD model : It is useful in the scenario where there is need for rapid software development and quick delivery typically business focused project for eg: customer relationship management
- e) The prototype model : It is beneficial when the client requirement are not well defined or are subject to frequent

Changes when creating a user interface for a new mobile app, using a prototype allow stakeholders to visualize the design early on and provide feedback for requirement before the final product is developed.

- f) Spiral model: In situation where the project involves a high level of risk assessment and continuous requirement such as large scale government project this model provides a structured approach for iterative development while managing risk effectively.
- g) Agile model: Agile methodologies like scrum are beneficial when requirement are constantly evolving and the development team needs to adapt quickly. It is useful for projects involving web development & mobile app where iterative development and customer feedback are crucial.

Q6)

Ans The waterfall & Agile model differ significantly in terms of project planning and progress tracking.

i) waterfall model -

- a) project planning: It follows sequential approach planning is done extensively at the beginning of the project where all the requirement are gathered & documented before development begins.

b) Progress tracking: progress tracked through predefined milestones. Each phase must be completed before moving next until it challenging to accommodate changes later in the project.

2) Agile methodologies:

a) Project planning: Agile approach (like scrum, or kanban) emphasize flexibility and adaptability. Planning is done in iteration & feedback loops. Team track progress using tools like burndown charts - velocity measurements.

b) Progress tracking: Agile relies on frequent iteration and feedback loops. Teams track progress using tools like burndown charts velocity, this allow for course correction & adjustment as needed. Waterfall model allow a rigid linear planning process with limited room for changes while agile methodology promotes iterative planning and tiny adjustments based on regular feedback, fostering a more adaptable approach for project management.

Q7)

Ans

Project metrics refer to quantitative measures across various aspects of software development used to quality, efficiency and performance of provides project process, valuable insights into project health.

i) Waterfall -

a) Development speed - longer development cycles might lead to slower speed compare to agile methodology

- b) adaptability to change - it is adaptable to change due to its sequential nature, which can lead to challenges when change is required.
- c) customer satisfaction - since changes can't be easily incorporated mid-project, customer satisfaction might be impacted if initial requirements do not meet the evolving need.

2) Agile system

- a) development speed - short iterations (sprints) can result in faster development speed and more frequent releases.
- b) adaptability to change - Agile methodologies like Scrum are designed to embrace change, allowing teams to adjust requirements between sprints.
- c) customer satisfaction - frequent feedback loops & incremental improvement often lead to higher customer satisfaction.

d) Kanban

- a) development speed: it is focused on continuous delivery which results in steady development. Speed at work items are pulled through the process.

- b) Adaptability to change: it is flexible and allows for changes to be introduced at any point, making it adaptable to shifting requirements.

Customer satisfaction, continuous delivery and focus on flow can lead to better customer satisfaction by quickly addressing this need.

8)

And These factors help in evaluating and selecting a suitable model for given project considering its unique characteristic and goal each model has its strength and weakness making this comparison relevant for making informed decision in software development.