

- iii. A)
- iv. D) ~~EEE~~ Test Maturity Model Integration (TMMI)
- v. Test Maturity Model Integration (TMMI)
- vi. Software Quality Assurance (SQA) Plan
- vii. Shift-left

2.b.i. Six Sigma:

* Six Sigma is a statistical quality assurance system^{method}, which gathers data & statistic analysis to improve the operational measures in an organization's manufacturing & service related processes.

* To accomplish ^{find} root causes of testing inefficiencies & the way it contributes to continuous improvement, Six Sigma uses DMAIC [Define, Measure, Analyse, Improve & Control]

Define: It Here, inefficiencies in the defined requirements of testing are found and analysed.

Measure: It ensures that the measurements collected are correct which are further converted to metrics

Analyse: The measured quantities are analysed & converted into useful metrics use mathematical formulae. The test process is analysed to find out whether any misinterpretation occurred & correct it.

Improve: The main goal of Six Sigma methodology is to improve the testing process. Based on the work done in define, measure & analyse phases, the techniques required to improve the testing process are suggested & implemented.

Control: Six Sigma ensures that controlled changes are implemented for software test improvement. It has full control over the entire testing process. It also has a feedback loop and hence continuous testing process improvement can be carried out by using Six Sigma. Its goal is to achieve 3.4 million defects.³ Six Sigma finds the root causes of

testing as it reviews the defined requirements for any discrepancies & in this way it contributes to continuous improvement.

2.b.ii. Software Quality Assurance (SQA) group:-

→ SQA group consists of software engineers, project managers, customers, salespeople & individual members.

It has the following divisions:-

a) Software Engineers:-

Apply technical principles to implement quality control & they conduct Formal Technical Review (FTR).

b) SQA Group:-
They oversee, review, report & assists the software engineers to ensure quality control.

Role of SQA group:

- ① Prepare an SQA plan for the project.
- ② Participate in the development of

project's software description process.

- ③ Reviews the software engineering rules to verify compliance with the software process
- ④ Audits designated work products to verify compliance with a part of the software process.
- ⑤ Deviations of compliance in related work & work products are documented according to the document ^{ing} procedures.
- ⑥ Record non compliance & report it to the senior management.

Explanation:

- ① The SQA plan is prepared & exhibited to the stakeholders. It contains:
 - a) Evaluations to be conducted
 - b) Audits and reviews to be conducted
 - c) Purpose
 - d) Documentation to be done
 - e) Reporting errors & correcting them

f) Code control
g) Reference
h) Testing methodology
i) Tools, methodologies & techniques
j) Software Configuration Management (SCM).

② The SQA group ensures internal standards, external standards (Eg: ISO 9001), organizational standards are all followed ~~so~~ ^{as} in correspondence to the requirements & builds the software description process.

③ The SQA group conducts reviews frequently ^{to ensure}, whether compliance to software & process is present otherwise it corrects them & makes sure the work product is working well

④ The SQA group verifies software process & corrects

them if necessary. Here, the actual software processes is ~~test~~ audited against the guidelines specified. Any discrepancy that occurs is corrected.

- ⑤ Here, the requirements gathered, analysis carried out, reviews performed, audits conducted & results found are all documented according the document procedure.
- ⑥ Any non compliance found is resolved & reported to senior management. The main goal here is to resolve non compliance completely.

In this way, SQA group ensures that the product meets the desired quality standards.



2.c.ii. Quality Management System (QMS):

→ Quality Management System is a formalized framework / system which is used to document processes, procedures & details for implementing quality control & ensuring software quality & assurance.

→ It is used to verify whether the customer requirements & the regulatory requirements are satisfied & it promotes organization wide direction.

→ Quality Control:

- a) Set of audits, reviews & processes done to ensure each work product has been built according to the specified requirements.
- b) It has a feedback loop to the process that created the work product.

→ Quality Assurance:

- a) Preventive set of actions which is used to give a greater

confidence that the software product will be completed successful -ly

Purpose of QMS:

QMS serves the following processes

a) Lowering cost:-

As customer & regulatory requirements are checked from an early phase, the cost for resolving defects or non-compliance in the later stages is reduced.

b) Reducing waste:-

As requirements are checked from beginning, so there is less wastage of resources.

c) Improves Process:-

QMS significantly improves the process as unwanted measures are discarded & requirements are checked. This enhances the process.

d) Engaging with staff:-

As QMS deals with solely requirements, the QMS teams frequently

interact with customers as well as managers & hence it promotes harmony.

e) Identifying & providing opportunities to staff:-

As continuous engaging has to take place, work opportunities will be generated with the task of engaging with the required people to verify requirements. This creates work opportunities.

f) Promoting organization wide direction:-

QMS promotes organization wide direction as it ensures both customer & organization requirements are satisfied.

Hence, multiple benefits like growth, sales increase & trust will be increased.

Benefits of QMS:

The two important benefits of QMS are:-

① Meeting Customer Requirements:

→ It ensures that customer requirements are satisfied which instills confidence in the heart of customers, resulting in more customers, more sales & more publicity of the organization.

② Meeting Organization Requirements:

→ It ensures that standards, provision of products & compliance within an organization are satisfied resulting in increased growth & profit.

In this way, implementing a QMS can contribute to better software quality & promotes customer satisfaction.

