
Q.1 a) Define a term project and give the importance of Software Project Management. (5)

Project:

- A project is defined as an undertaking of non-routine, non-repetitive nature having prescribed objectives in terms of scope, time, quality and cost.
- Project is a temporary effort undertaken to create a unique product, service, or result.

Importance of Software Project Management:

To control scope of Project and Manage Change:

- Although the project deliverables are defined at the outset of the project, small changes in project deliverables are common.
- These changes are demanded by customers, stakeholders, management, suppliers or the project team itself. Individually, these changes demands may seem acceptable and manageable, but collectively these changes demands can lead to a significant expansion in the project scope and can lead to an overrun in schedule and budget.

To Deliver Projects on Time and within Budget:

- The project management process includes cost calculations such as return on investments (ROI).
- Once ROI is established it is for the project manager to ensure that the project schedule and budget are adhered to else the project will fail to deliver the expected results.

To ensure the focus of the project team:

- It is common for the project team to drift from the main tasks and spend unnecessary longer time on other tasks.
- Hence, it is the responsibility of the project manager to ensure that the project team focuses on the right tasks.

To collect user requirement from disparate sources:

- The project manager at the initiation phase should collect user requirements, project constraints and conduct a feasibility study to build a strong business case justification.
- Due to this the project manager is able to avoid future dissent from users and is able to communicate project benefits.

To define the critical path to optimally complete the project:

- Every project is made up of connected activities each having their individual's constraints.

- By using the critical path method technique the project manager is able to identify the critical path and thus ensure the successful completion of the project.

To provide a process for estimating project resources, time and costs:

- Solid project management tools and techniques and past experience will enable the project manager to correctly estimate the project resources requirement as well as determine the time required for the completion of the project and the likely expenditure.

To communicate project progress, risks and changes:

- The stakeholders of the project need to be kept updated on the project progress, hurdles encountered and changes incorporated.

- Every good project management plan has a communication plan.

To explore project assumptions:

- Although ample ground work is done for a project there are bound to be a few assumptions on which the project is based. A project based on too many assumptions could ruin its chances of success.

To prepare for unexpected project issues:

- Howsoever, one may be prepared there are bound to be a few issues which may suddenly surface. Hence, the project manager should always be prepared with an alternate plan.

To document the knowledge gained from the project:

- The last phase of the project involves the documentation of all that has been learnt at each phase in the project. These documented experiences provide guidance to other project manager in other projects.

Q1 b) Explain the stages involved in project management life cycle in detail. (5)

The project life cycle describes the various logical phases in the life of a project from its beginning to its end in order to deliver the final product of the project. The idea of breaking the project into phases is to ensure that the project becomes manageable, activities are arranged in a logical sequence, and risk is reduced.

(1) The Project Goal

The first step of any project, irrespective of its size and complexity, is defining its overall goal. Every project undertaken aims to provide business value to the organization hence the goal of the project should focus on doing the same. Now, the goal of the project needs to be defined initially as it provides the project team with a clear focus and guides it through each phase of the project. The project is hazy and seems risky at the start, but as the project goals get defined and starts making progress, things start to look brighter and the probability of success increase.

(2) The Project Plan

Also known as baseline plan. The project plan is developed to provide answers to various project related queries such as:

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What the project aims to achieve?-The project deliverables

How does the project team aim to achieve it?-The tasks and activities

Who all will be involved in the project?-The stakeholders and the project team

How much will it cost?-The project budget

How much time will it take?-The project schedule

What are the risks involved?-Risk identification

(3) Project Plan Execution

The project plan thus developed needs to now be executed. The project progress should be compared with the baseline plan and communication to all of the project's stakeholders. The project manager has to constantly monitor the project's progress, schedule, budget, and resources.

(4) Project Closure

Project closure marks the culmination of the project. In the event of the project having completed all the work as planned, the project sponsor should formally acknowledge its successful completion, discharge all resources from the ongoing project, and make necessary payment of dues of any external consultants and suppliers. The project closure is also marked by the presentation of a project report that documents all the project deliverables.

(5) Project Evaluation

It is not possible to evaluate the true value of any IT project immediately after its implementation. Sometimes the goals are long term and the results of the project can only be gauged after the passage of a certain period of time. However, this does not mean that evaluation should not be undertaken immediately. For starters, the project team should document all its experience-things it did right, things it should have done differently, and all the lessons learned during the entire course of the project.

The project manager should evaluate each team member and provide feedback to the member as well as the management, the performance of the project manager should be evaluated by the senior manager. Evaluation of the project manager is carried out in terms of; the project delivering the promised work, abiding by budgetary provisions, following established processes, and ability to manage resources.

Q1 c) Write a note on Project portfolio management.

(5)

-A portfolio is a collection of projects, programs and other associated work that are grouped together to facilitate effective management of that work to meet strategic business objectives.

-The projects and programs within an organizations portfolio may not necessarily be associated with each other and the allotment of funding and resources is on the basis of priority and risk/reward equation.

-Organizations manage their portfolio on the basis of specific goals such as maximizing the value of the portfolio and excluding projects not meeting the portfolio's strategic objectives.

-Other goals for managing portfolio could be balancing the portfolio investment and for efficient use of resources.

-IT portfolio management is the application of management techniques to the investments, projects, programs and activities of the company's Information Technology Department.

-The primary objective of IT project management is the quantification of previously undertaken IT projects and programs, enabling measurement and objective evaluation of investment scenarios.

Three key aspects of PPM are:

Project Portfolio Definition:

-Record in a single repository details

Project Portfolio Management:

-Details costing of projects and managers hope are recorded

-Actual performance are tracked

Project Portfolio Optimization:

-Better balance of project may be achieve

-Profitable, but risky

-Modest benefits, fewer risks

Q1 d) What is the importance of identifying the scope and objectives of a project? (5)

Project scope management includes the processes required to ensure that the project includes all the work required, and only the work required, to carry out the project successfully. Project scope management is primarily concerned with defining and controlling what is and is not included in the project.

As per the Project Management Body of Knowledge (PMBOK), the knowledge area of Project Scope Management comprises of five processes, namely, scope initiation process, scope planning, scope definition, scope verification and scope change control.

(1) Project Scope Initiation Process

In this process the project sponsor gives the project manager the authority and resources to define the project scope

The authority to commit time and resources to defining the project scope is given when the project plan and charter are being developed.

(2) Project Scope Planning Process

The project scope planning process identifies what work is and is not part of the project work. It primarily settles the boundaries of the project work.

It is essential to also identify what is not a part of the project work to avoid future problems.

As **Olde Curmudgeon** has stated, "Failure to define what is part of the project, as well as what is not, may result in work being performed that was unnecessary to create the product of the project and thus lead to both schedule and budget overruns".

(3) Project Scope Definition Process

The project scope definition process identifies the project deliverables and the product deliverables.

Project deliverables is the work that needs to be accomplished to deliver a product with specific features and functions.

Product deliverables are the features and functions that characterise a product. The boundaries and deliverables defined by the scope planning and definition facilitate the development of the project charter and plan. The requirements of the project defines its boundaries.

(4) Project Scope Verification Process

The scope verification process checks the scope for accuracy and completeness.

The project scope needs to be verified. Scope verification is the process of obtaining the stakeholders formal acceptance of the completed project scope and associated deliverables.

Scope verification ensures that the project deliverables are completed as per the standards laid in the delivery definition table (DDT). Scope verification includes the review of each deliverable and comparison with the standards specific in the DDT.

(5) Project Scope Change Control

Although, the project scope has been set with great deliberation and thought, changes to it are bound to arise as the project progresses and new information or need emerges. This warrants the need for project scope change control to manage these changes. The change control process has to approve the change to initiate amendments in project schedule and budget.

The project scope change control process also protects the scope boundaries from expanding unnecessary due demands of additional features and functions to the project scope.

There is a direct relationship between project scope, budget and schedule. An increase in the scope i.e. expansion of scope boundaries leads to a direct increase in project's budget and schedule and vice versa. Hence, such change demands need to be properly scrutinized before being approved.

Q1 e) How is resource allocation managed in an activity of programme management? (5)

A Programme is a group of related projects which means that the resources, namely people, of the organization have to be shared between concurrent projects.

Every organization has a pool of people of varying expertise, such as developers, network experts, database designers, etc. These people will have to share amongst the number of projects within the programme.

The programme manager will have to ensure the optimal use of the specialist staff and plan the allotment of this staff to the individual project within the programme.

This means that some activities in some projects will have to be delayed until the required staff has completed the previous task allotted to him.

The programme manager will have to ensure that the highly paid technical staff are utilised to optimum and their utilization is not intermittent. Thus, allocation of resources is critical from the point of view of success of the programme.

The resource allocation management includes-

Defining proper organization project by creating a project team and allocating responsibilities to each team member.

Determining resources required at a particular stage and their availability

Manage resources by generating resource request when they are required and de-allocating them when they are no more needed.

Q1 f) Write a note on risk evaluation and management.

(5)

Risk - A risk is any condition or event whose occurrence is not certain, but if it were to occur it would have a negative impact on the outcome of the project.

Risk evaluation - There is a risk that software might exceed the original specification and that a project will be completed early and under budget. That is not a risk that needs concern us.

Every project involves risk of some form. When assessing and planning a project, we are concerned with the risk of the project's not meeting its objectives.

Risks are probabilistic events which everyone is hopeful that they would not occur. However, if the risk events were to materialize they would surely harm the project.

Risks are a natural accompaniment of IT projects; on the other hand IT projects are themselves a risk, as technology change may make the project redundant before it is even completed.

Risk management - Risk can be managed by following certain processes:

1) Risk Identification

Risks identified in the planning phase will evolve over time. Some risks may be eliminated while some new ones may be added to the list. Resolved risks should be struck off the list and new ones should be added.

2) Risk Assessment

The risk management process is created, baseline and kept ready in the project planning phase for the execution phase.

3) Evolution of Risks

Though the likely risks have been identified in the project planning phase they become more definitive during the execution phase. The project manager is in a better position to define and specify the risk items.

4) Risk Management an Iterative Process

Risk management is an iterative process which is initiated in the project planning phase and then continues right through the entire lifecycle of the project.

5) Risk Meeting

Risk meeting contribute to the process of risk identification and development of action plans to tackle the risk.

Collective minds enable better and faster identification and resolution of risks.

6) Risk Resolution

Not all risk have the same impact on the project while some may cause grave damage others may cause mild bruises. Hence, risks are graded accordingly to their ability to impact the project and resolution strategies are developed

Q2 a) Explain different approaches used for fast delivery of a project.

(5)

Rapid Application Development (RAD) is used for fast delivery of a project.

Rapid Application Development is a form of Agile Software Development Method. Unlike Waterfall methods, RAD emphasizes working software and user feedback over strict planning and requirements recording.

While RAD de-emphasizes strict planning, there are still a handful of steps or phases each development project goes through when using the rapid application development methodology.

1. Figure out the requirements: Every piece of software or app is built for a reason, RAD starts with figuring out what the project is supposed to accomplish.
2. Build prototypes: The project team should start working on building functional models right after the requirements, deadline, and budget figured out.
3. Get user feedback: The users should already be familiar with most, if not all, parts of the finished product before project's completion.
4. Repeat steps 2 & 3 until the project is done.
5. Test the system through different scenarios
6. Present the system.

Q2 b) What are the advantage and disadvantage of a Spiral Model?

(5)

Spiral Model - The spiral model is similar to the incremental model, with more emphasis placed on risk analysis. The spiral model has four phases:

Planning, Risk Analysis, Engineering and Evaluation.

A software project repeatedly passes through these phases in iterations called **SPIRALS**.

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Advantages of Spiral Model:

High amount of risk analysis hence, avoidance of Risk is enhanced.

Good for large and mission-critical projects.

Strong approval and documentation control.

Additional Functionality can be added at a later date.

Software is produced early in the software lifecycle.

Disadvantages of Spiral Model:

Can't be a costly model to use.

Risk analysis requires highly specific expertise.

Project's success is highly dependent on the risk analysis phase.

Doesn't work well for smaller projects.

Q2 c) Discuss the common problems faced during effort estimation. (5)

-Overestimation creates the problem that the estimate become self-fulfilling. The task takes longer than it would have done with a more accurate estimate in place.

-Some managers believe that it is beneficial to underestimate rather than overestimate as although the project might not complete on time or to cost it might still be implemented within a much shorter period than the project with a more generous time estimate. However, there are other problems associated with underestimated projects.

-If a task is assumed to take a long time than it actually needs, one of two things will happen. Either the task gets done at lower quality, or the task doesn't get done on time and any tasks dependent on it are pushed out.

-Quality suffers as the inexperienced staff buckles under pressure of pressing deadlines and produces work that is substandard.

-The problems of underestimation are governed by Weinberg Zeroth Law of Reliability which states that "**If a system doesn't have to be reliable, it can meet any other objective**".

-If a quality, like reliability, is not clearly specified, you can deliver the project earlier, if you interpret the quality requirements as "**whatever it happens to be when the deadline arrives.**"

Q2 d) State and explain Caper Jones estimating rules. (5)

Rules Formulated by Capers Jones-

Rule 1: SLOC Function Point Equivalence

When it comes to estimating the size of the project the function point analysis is used on account of its advantages. Thus, it becomes necessary for the project manager to determine SLOC measure from its function point measurement.

Jones through his experience determined the equivalence between SLOC and function point. SLOC function point equivalence varies across different programming languages so it would take about 320 lines of assembly code to implement one function point. In C language to express one SLOC several instructions of assembly language are needed.

Rule 2: Project during Estimation

Function point raised to the power 0.4 predicts the approximate development time in calendar months.

E.g. if the size of a project is estimated by 325 function points i.e. approximately 40,000 SLOC then the completion time for the project would be approximately 17 months.

Rule 3: Rate of Requirement Creep

User requirements creep in at an average rate of 2% per month from the design through coding phases.

Requirement creep is the increase in the requirements of the user and these keep on increasing for a variety of reasons as the project progresses.

Requirement creeps is not expected to increase during project testing and installation stages. The rule states that creep takes between the requirement phases till the testing phase and therefore only that part of the project should be considered.

Rule 4: Defect Removal Efficiency

Each software review, inspection or test step will find and remove 30% of the bugs that are present.

Defect removal steps at various stages of the project development ensure that the final product is reliable.

Rule 5: Project Manpower Estimation

The size of the software in function points divided by 150 predicts the approximate number of personnel required for developing the application.

Rule 6: Software Development Effort Estimate

The approximate number of staff months required to develop software is given by the software development time multiplied by the number of personnel required.

Function points divided by 500 predicts the approximate number of personnel required for regular maintenance activities.

Q2 e) Explain the top down approaches associated with parametric models.

(5)

In this form of estimating the project manager takes the budget of a similar project estimates the budget for the current project.

Project managers use this approach when they undertake projects which are similar to the ones they have implemented in the past.

The information available with the project manager allows him to save time on estimating the cost of the project using the bottom-up approach. However, this approach is not so useful for IT projects as most of them are new and IT infrastructure changes rapidly making it difficult to work on historical information.

Hence, these estimates are not reliable and are not acceptable to management as the final estimate.

Q2 f) Write a note on COCOMO II Model.

(5)

Constructive Cost Model II (COCOMO II) is a model that allows one to estimate the cost, effort, and schedule when planning a new software development activity.

COCOMO II is the latest major extension to the original COCOMO (COCOMO@81) model published in 1981.

It consists of three sub models, each one offering increased fidelity the further along one is in the project planning and design process. Listed in increasing fidelity, these sub-models are called the Applications Composition, Early Design, and Post-architecture models.

COCOMO II is an alternative to include components of uncertainty according to level of information available.

It is a parametric model that establishes mathematical equations that describe the relationships between software size-primary cost factor usually represented in terms of function points- and other secondary factors that look to identify features of a product, process, people and platform.

The model provides a complete framework to determine local productivity factors (productivity constants) based on time and effort data in past projects.

One of the main advantages of COCOMO II is to provide estimates of time and effort, and from that, suggest the size of the team.

COCOMO II can be used for the following major decision situations:

Making investment or other financial decisions involving a software development effort

Setting project budgets and schedules as a basis for planning and control

Deciding on or negotiating trade-offs among software cost, schedule, functionality, performance or quality factors

Making software cost and schedule risk management decisions

Deciding which parts of a software system to develop, reuse, lease, or purchase

Making legacy software inventory decisions: what parts to modify, phase out, outsource, etc.

Deciding how to implement a process improvement strategy, such as that provided in the SEI CMM.

Q3 a) What is the necessity of activity planning?

(5)

1) Feasibility Assessment

Is the project possible within require timescales and resource constraints? It is not until we have constructed a detailed plan that we can forecast a completion date with any reasonable knowledge of its achievability.

2) Resource Allocation

What are the most effective ways of allocating resources to the project and when should they be available? The project plan allows us to investigate the relationship between timescales and resource availability.

3) Detailed Costing

How much will the project cost and when is that expenditure likely to take place? After producing an activity plan and allocating specific resources, we can obtain more detailed estimates of costs and their timing.

4) Motivation

Providing targets and being seen to monitor achievement against targets is an effective way of motivating staff, particularly where they have been involved in setting those targets in the first place.

5) Co-ordination

When do the staff in different departments need to be available to work on a particular project and when do staff need to be transferred between projects?

The project plan, particularly with large projects involving more than a single project team, provides an effective vehicle for communication and co-ordination among teams.

Q3 b) Explain network planning model and the concept of backward pass.

(5)

Network planning models:

Gantt Chart-

A Gantt chart or more popularly known as the bar chart is one of the most commonly used project management tools and are used in tracking project schedules.

The primary reason for the popularity of the Gantt chart is because they are easy to plot and simple to understand.

A Gantt chart is a graphical representation of a project plan on a time scale. The X axis of the chart represents time i.e. project duration while the Y axis represents activities in the form of rectangular bars.

The position and length of the bar reflects the start date, duration of the activity and the end date of the activity.

Each horizontal bar represents one specific activity to be performed and the beginning and end of each bar represents the commencement and completion of the activity.

Gantt chart enables the user to understand what has to be done i.e. the activities to be performed and when it is to be done i.e. the schedule of the activities.

Milestone Chart-

Milestones, are important part of the project schedule especially for large projects.

Project managers like to focus on meeting milestones so as to emphasize the project accomplishment.

Milestone charts are similar to Gantt Charts only that they highlight the scheduled completion of major deliverables and key external interfaces.

The Gantt Chart can also be made to incorporate the milestones within the project. Milestones are marked by the completion of various project tasks and hence are created by entering them as tasks with zero duration.

Backward Pass: The purpose of performing a backward pass on a network is to calculate the latest time that each activity in the network can start and finish and still maintain the minimum overall duration of the project as calculated by the forward pass.

-Late Start (LS) = Late Finish-Duration

-Late Finish = Minimum Late Start (LS) of related successor activity.

Q3 c) Define the term risk and discuss the ways to deal with them.

(5)

Risk - A risk is any condition or event whose occurrence is not certain, but if were to occur it would have a negative impact on the outcome of the project.

From this explanation of risk we can derive the following:

-Occurrence is a probabilistic condition.

-Will have a negative impact on the project were the event to occur.

There are three faces to deal with the risk:

1) Phase I: Prepare for Risk Management

In this framework lays the groundwork for the other two phases and hence should be completed before executing the other two phases.

This phase determines who is sponsoring the risk management, plan for conducting risk management, and the resources required to effectively conduct risk management.

2) Phase II: Perform Risk Management Activities

In the second phase risk management activities are performed as planned. First and foremost the phase identifies the risks that could affect the achievement of the key program objectives.

This phase also specifies how each risk will be addressed and the action needed to ensure that each risk is maintained within tolerable limits over the entire duration of the project.

This phase also determines whether the mitigation plan is having the desired effect.

-Access Risk

-Plan for Risk Mitigation

-Mitigate Risk

3) Phase III: Sustain an Improve Risk Management

In the third phase activities are performed to sustain and improve risk management effort over the entire duration of the project.

This phase specifies the risk management assets and work products that need to be under configuration, lessons learnt while preparing for risk management and conducting risk management and how the entire risk management exercise can be improved.

Q3 d) Describe Monte Carlo simulation.

(5)

Simulation is a technique which describes a process by developing a model of that process, and then performing experiments on the model to predict the behaviour of the process over time.

Monte Carlo simulation is a computerized mathematical technique that allows people to account for risk in quantitative analysis and decision making. The technique is used in project management.

Monte Carlo simulation furnishes the decision-maker with a range of possible outcomes and the probabilities they will occur for any choice of action. It shows the extreme possibilities - the outcomes of going for broke and for the most conservative decision-along with all possible consequences for middle-of-the-road decisions.

Monte Carlo simulation performs risk analysis by building models of possible results by substituting a range of values-a probability distribution-for any factor that has inherent uncertainty. It then calculates results over and over, each time using a different set of random values from the probability functions. Depending upon the number of uncertainties and the ranges specified for them, a Monte Carlo simulation could involve thousands or tens of thousands of recalculations before it is complete. Monte Carlo simulation produces distributions of possible outcome values.

By using probability distributions, variables can have different probabilities of different outcomes occurring. Probability distributions are a much more realistic way of describing uncertainty in variables of a risk analysis.

Q3 e) Explain the nature of resources and their scheduling.

(5)

Nature resources:

The resources needed for software projects are no different than other projects in the engineering industry.

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In software project management the people's component is probably the most crucial as they form the backbone of the project.

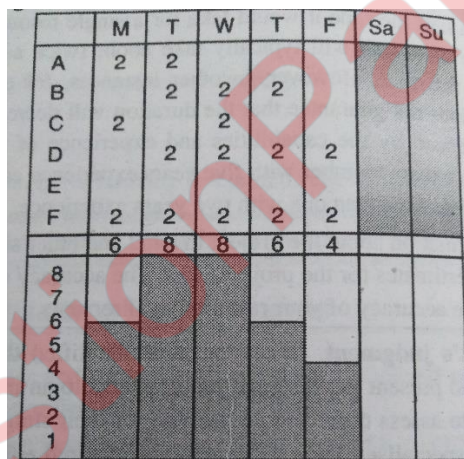
Scheduling Resources:

Once all the resources required for the completion of the project have been identified and the requirement list is prepared it is time to map this on the activity plan to access the distribution of resources required over the duration of the project. This can be done by representing the activity as a bar chart and use this to produce a resource histogram for each resource.

The output of the process of resource identification is the resource histogram. Resource Allocation identifies what resources are needed to complete activities and critical path calculates when the activities can be performed.

Combining these two sets of data allows the demand for each type resource to be aggregated overtime. This information is typically represented as a resource histogram.

The diagram below illustrates a number of activities on a Gantt Chart. The numbers represent the amount of a specific resource required each day. The numbers represents the amount of a specific resource required each day. The numbers are summed and shown graphically at the bottom of the diagram as a resource histogram:



-The resource histogram helps us identify where the demand for a resource exceeds the supply.

Q3 f) What are the factors considered while allocating tasks to the individuals? (5)

-While allocating human assets to software project activities the project manager has to be specific about two things namely,

- A) Nature of Software Development.
- B) Skills and experience that will influence the time taken and the quality of the project.

-The project manager has to also consider the availability of the person i.e. if the person has any work commitments towards his department.

-Remember, a project is an undertaking of a non-routine, non-repetitive nature and hence people with required skills are drawn from various departments of the organization and hence it is necessary to check their availability with them or the department in which they work on a regular basis. Thus, it is essential that the project manager confirms the availability of all team members when required for the project before finalizing the project schedule.

-The project manager has to allocate people with experience to activities on the critical path.

-The critical path is the longest path in the project and hence it is essential to pay the utmost attention to its completion and hence the allocation experienced people. Also, the allocation of experienced people could reduce project uncertainties.

-The junior staff or the people with little experience should be allocated to non-critical activities and their skills should be honed to undertake critical activities in the future.

-Building a project team is an art and the project manager has to ensure that he has the right person for the right job and that they are compatible with the project requirements.

Q4 a) Give the benefits of review in the process of project monitoring and control. (5)

-It is one such methodology that offers an opportunity to the development team and the client, to get clarity on the project as well as its requirement.

-With software review, the team can verify whether the software is developed as per the requested requirements or not.

-It improves the productivity of the development team.

-Makes the process of testing time and cost effective, as more time is spent on testing the software during the initial development of the product.

-Fewer defects are found in the final software, which helps reduce the cost of the whole process.

-The reviews provided at this stage are found to be cost effective, as they are identified at the earlier stage, as the cost of rectifying a defect at the later stages would be much more than doing it in the initial stages.

-In this process of reviewing software, often we train technical authors for defect detection process as well as for defect prevention process.

-It is only at this stage the inadequacies are eliminated.

-Elimination of defects or errors can benefit the software to a great extent. Frequent check of samples of work and identification of small time errors can lead to low error rate.

-As a matter of fact, this process results in dramatic reduction of time taken in producing a technically sound document.

Q.4 b) Write a note on change control. (5)

-IT Project Management is like a well-rehearsed play going awry at the last moment. No matter the number of hours of practicing and rehearsing, there are bound to be some last minute glitches which can put the entire project on tender hooks.

-Project managers have to get back to the drawing board and start redesigning the process again. They may have either discovered a better way of getting job done or some changes requested by management or user in the project deliverables may have prompted the change in plans.

-Whatever be the reason the project manager has to decide whether the change in the project is feasible and the system to put in place to review, approve or decline the request for change.

-Although, incorporating changes in IT project management is not an easy task they are subject to changes due to the dynamic nature of the industry.

-Changes may be made necessary due to the introduction of new software, security issues, or new requests from stakeholders.

-On his part the project manager has to evaluate the time, cost, risk, and any other repercussions that each change requests brings along with it. In case the change request it needs to be documented, tracked and implemented.

-However in the real world these are not how things work. Changes are forced onto the project and the project manager is forced to alter the project scope.

Q4 c) Explain the advantages and disadvantages of fixed price contracts.

(5)

Advantage-

Known customer expenditure: If there are few subsequent changes to the original requirements, then the customer will have a known outlay.

Supplier motivation: The supplier has a motivation to manage the delivery of the system in a cost-effective manner.

Disadvantage-

Higher price to allow contingency: The suppliers absorbs risk for any errors in the original estimate of product size. To reduce the impact of this risk, the supplier will add a margin when calculating the price to be quoted in a tender.

Difficulties in modifying requirements: The need to change the scope of the requirements sometimes becomes apparent as the system is developed - this can cause friction between the supplier and customer.

Upward pressure on the cost of changes: When competing against other potential suppliers will try and quote as low a price as possible. If, once the contract is signed, further requirements are put forward, the supplier is in a strong position to demand a high price for these changes.

Threat to system quality: The need to meet a fixed price can mean that the quality of the software suffers.

Q4 d) Explain the stages in contract placement.

(5)

1. Initial requests

The contract management process begins by identifying contracts and pertinent documents to support the contract's purpose.

2. Authoring contracts

Writing a contract by hand is a time-consuming activity, but through the use of automated contract management systems the process can become quite streamlined.

3. Negotiating the contract

Upon completion of drafting the contract, employees should be able to compare versions of the contract and note any discrepancies to reduce negotiation time.

4. Approving the contract

The instance in which most bottlenecks occur is getting management approval. Users can preemptively combat this by creating tailored approval workflows, including parallel and serial approvals to keep decisions moving at a rapid pace.

5. Execution of the contract

Executing the contract allow users to control and shorten the signature process through the use of e-Signature and fax support.

6. Obligation management

This requires a great deal of project management to ensure deliverables are being met by key stakeholders and the value of the contract isn't deteriorating throughout its early phase of growth.

7. Revisions and amendments

Gathering all documents pertinent to the contract's initial drafting is a difficult task. When overlooked items are found, systems must be in place to amend the original contract.

8. Auditing and reporting

Contract management does not simply entail drafting a contract and then pushing it into the filing cabinet without another thought.

Contract audits are important in determining both organization's compliance to the terms of the agreement and any possible problems that might arise.

9. Renewal

User manual contract management methods can often result in missed renewal opportunities and business revenue lost.

Automating the process allows an organization to identify renewal opportunities and create new contracts.

Q4 e) Write a note on ethical and profession concerns as a member of any organization. (5)

- i. The project manager should avoid conflict of interest and relationships that question his impartiality.
- ii. Project team members should ensure the confidentiality of the information trusted on them.
- iii. Ensure full disclosure to mitigate any risk impropriety.
- iv. Maintain a strong sense of confidence with respect to issues such as confidentiality, product reliability and commitment to stakeholders and customers.
- v. Corporate resources should be used judiciously and only for official purposes. Team members should refrain from using them for personal purposes.
- vi. Personal opinion and corporate opinion should always be in synch.
- vii. Results should not be fudged to make them appear than what they are.

Managing ethical values in the projects legitimizes managerial actions, strengthens the coherence and balance of the organization's culture, improves trust in relationships between individuals, supports greater consistency in standard and qualities of products, and cultivates greater sensitivity to the impact of the organizations values and messages.

Q4 f) Explain Taylor's model of motivation. (5)

Taylor's viewpoint is reflected in the use of pieces-rates in manufacturing industries and sales bonuses amongst sales forces. A problem that project leaders must be aware of is that piece-rates often cause difficulties if a new system is going to change work practices. If new technology is going to improve productivity, the question of adjusting piece-rates downwards to reflect this will be a sensitive issue. Usually, radical changes in work practices have to be preceded by a move from piece-rates to day-rates. Even when work practices are stable and output can be easily related to reward, people paid by the amount they produce will not automatically maximize their output in order to maximize their income. The amount of output will often be constrained by 'group norms', informal, even unspoken, agreements among colleagues about the amount to be produced. Rewards have to be related in a simple way to the work produced.

'This support department does well because we're a team, not because we're all individuals. I think it's the only way the support team can work successfully.'

In this kind of environment, a reward system that makes excessive distinctions between co-workers can be damaging to morale and eventually to productivity.

Q5 a) Describe a virtual team and the advantage of forming a virtual team. (5)

Virtual Team: A virtual team is group of people to participate in common projects by making collaborative efforts to achieve shared goals and objectives. These peoples performed tasks and jobs in a virtual work environment created and maintained through IT and software technologies.

Advantage of forming a virtual team:

Cost savings - The biggest advantage of virtual team enjoyed by an organization is the associated cost savings. The organization can do away with huge expenses on real estate, office spaces, utilities bills such as gas, electricity, water etc. and executives' travel.

Leverage Global Talent - Virtual Teams allows organizations to look for talent beyond their country of origin. This brings together the experts and specialists from across the globe to work together on the project.

Increased Productivity & Higher Profits - Members of virtual teams tend to have higher focus on the task at hand. As a practice virtual team supports flatter organization structure. The members do not have to deal with unnecessary bureaucracy which slows down the decision making. This enhances the productivity which shows as higher profits.

Reduced Time to Market - Since the members span the time zones, there could be different team working on the same project 24*7, so when one member sleeps there will be another one somewhere else who would start work where the former had left. This shortens the product development time.

Newer Opportunities - If we see at larger societal level, virtual teams have created newer opportunities for people who are less mobile and hesitant to relocate due to either family requirement or physical challenge. Now any task that does not require the physical presence of a person and which can be supported by communication technology throws an opportunity for many deserving candidates.

Q5 b) Write a role of different types of people needed to form a balanced team. (5)

-Most successful teams shape their purposes in response to a demand or opportunity put in their path, usually by the top management. This helps teams get started by broadly framing the company's performance expectations.

-The top management is responsible for clarifying the charter, rationale and performance challenge for the team, but management also must leave enough flexibility for the team to develop commitment around its own spin on that purpose, set of specific goals, timing and approach.

-To lead a team effectively, you must first establish the leader. Remember that the most effective team leaders build their relationships of trust and loyalty, rather than fear or the power of their positions.

-Once the leader is firmly established it is form the team that will enable him to achieve the task.

-Team members should never be selected on the basis of only good personal relations or designated position in the organization structure.

-An appropriate blend of right skills must be ensured in teams. It goes without saying that no team can claim all requisite skills at its disposal from within.

However, teams, team relationship and teamwork are very conducive to learning, acquiring and perfecting new skills.

Q5 c) Define the term quality. Explain McCall's quality model.

(5)

Quality: As software is not a tangible product, software quality is not easily definable. Software has many quality characteristics. However, quality management revolves around defects. Hence, delivered defect density i.e. the number of defects per unit size in the delivered software is the industry accepted definition of quality.

McCall's Quality Model:

Also called as General Electronics Model. It mainly has 3 major representations for defining and identifying quality.

(A)Product Revision

(1)Maintainability: Effort required to locate and fix a fault in the program within its operating environment.

(2)Flexibility: The ease of making changes required as dictated by business by changes in the operating environment.

(3)Testability: The ease of testing program to ensure that it is error-free and meets its specification, i.e., validating the software requirements.

(B)Product Transition

(1)Portability: The effort required to transfer a program from one environment to another.

(2)Re-usability: The ease of reusing software in a different context.

(3)Interoperability: The effort required to couple the system to another system.

(C)Product Operations:

(1)Correctness: The extent to which a functionality matches its specification.

(2)Reliability: The system's ability not to fail/the extent to which the system fails.

(3)Efficiency: Further categorized into execution efficiency & storage efficiency & generally means the usage of system resources.

(4)Integrity: The protection of program from unauthorized access.

(5)Usability: The ease of using software.

Q5 d) State and explain different levels of Capability Maturity Model (CMM).

(5)

Rather than just checking that a system is in place to defect faults, a customer might wish to check that a supplier is using software development methods & tools that are likely to produce good quality software. A customer will feel more confident, for instance, if they know that the supplier is using structured methods. This attempts to place organizations producing software at one of five level of process maturity to indicate the sophistication and quality of their software production practices.

There in all five levels in the model.

Level 1: Initial

The procedures followed tend to be haphazard. Some projects will be successful, but this tends to be because of the skills of particular individuals including project managers. There is no level 0 as so any organization would be at this level by default.

Level 2: Repeatable

Organizations at this level will have basic project management procedures in place. However, the way an individual task is carried out will depend largely on the person doing it.

Level 3: Defined

The organization has defined the way in which each task in the software development life cycle is to be done.

Level 4: Managed

The product and process involved in software development are subject to measurement and control.

Level 5: Maturity

Improvement in procedures are designed and implemented using the data gathered from the measurement process.

Q5 e) Explain the metrics correlated with Software reliability. (5)

1. Product metrics: function point metric is a method of measuring the functionality of software development based upon a count of inputs, outputs, master files, inquires, and interfaces. The method can be used to estimate the size of a software system as soon as these functions can be identified. It is a measure of the functional complexity of the program. It measures the functionality delivered to the user and is independent of the programming language. It is used primarily for business systems.

2. Project management metrics: Good management can result in better products and a relationship exists between the development process and the ability to complete projects on time and within the desired quality objectives. Cost increase when developers use inadequate processes. Higher reliability can be achieved by using better development process, risk management process, configuration management process, etc.

3. Process metrics: The quality of a product is a direct function of the process, metrics can be used to estimate, monitor and improve the reliability and quality of software.

4. Fault and failure metrics: The goal of collecting the fault and failures metrics is to be able to determine when the software is approaching failure-free execution. Test strategy is highly relative to the effectiveness of fault metrics. Usually, failure metrics are based upon customer information regarding failures found after release of the software. The failure data collected is therefore used to calculate failure density, Mean Time between Failures (MTBF) or other parameters to measure to predict software reliability.

Q5 f) Discuss the reasons for project closure.

(5)

-Project is closed when it has reached its stated objectives i.e. it has been successfully implemented and been handed over to its user. A successful project is simply developed to its customer.

-A project may be closed when it is transferred to another organizational division to take the work forward. Such a decision may be taken if the management feels that the current project team is not a position to reach the project objectives.

-Another reason for project closure or rather premature project closure is when the project manager reaches the conclusion that the project is unfeasible and that the objectives are out of reach, resulting in a prematurely closed down project.

-A project on perfect course may face closure on changed requirements of the user naming the project redundant and forcing to call of the project.

-Crises within the organization or customer may force the closure of a project.

-Sudden an unanticipated changes in technology may force the closure of a project.

-Budgetary issues may force the closure of a project.

-Absence of key project personnel may force project closure.

-The planning of project closure should be top priority and should be planned for in the inceptive stages of a project as it's elevated the chances of a successful completion.

-The importance accorded to the closure stage of the project can be gauged when organization employ a specific manager, who possess an appropriate set of skills and knowledge of project closure, to overlook this phase of the project.