1. Attempt any three of the following:

a. What is Project? What are its characteristics? (5)

Ans :

- A project is an activity to meet the creation of a unique product or service and thus activities that are undertaken to accomplish routine activities cannot be considered projects.
- A project is a combination of interrelated activities to achieve a specific objective within a schedule, budget, and quality.
- It involves the coordination of group activity, wherein the manager plans, organizes, staffs directs, and controls to achieve an objective, with constraints on time, cost, and performance of the end product.
- **Characteristics of Project :-**
1. **Invisibility :**
- When a physical artefact such as a bridge or road is being constructed the progress being
- made can actually be seen.
- With software, progress is not immediately visible to others and may be difficult to quantify In terms of the percentage of work done.
2. **Complexity :**
- Software projects are complex in nature than other engineering projects and the complexity can be gauged by the success rate of these projects.
3. **Flexibility:**
- The ease with software can be changed is usually seen as one of its strengths.
- However, this means that where the software system interfaces with a physical or organizational system, it is expected that, where necessary, the software will change to accommodate the other components rather than vice versa.
- This means the software systems are likely to be subject to a high degree of change.
4. **Conformity :**
- These physical systems have complexity, but are governed by consistent physical laws. Software developers have to conform to the requirement of human clients.
- It is not just that individuals can be inconsistent.
- Organizations, because of lapses in collective memory, in internal communication or in effective decision making can exhibit remarkable, 'organizational stupidity'.

b. State and Explain phases of Project Management LifeCycle ? **(5)**

Ans :

Phase I: Project Conceptualization and Initialization

- In this phase, the project's primary goal is defined and understood, which helps in shaping the project's scope.
- Project Initiation is the official starting point, where the project manager ensures a clear understanding of the business needs throughout the project's lifecycle.
- The project charter is created, authorizing the project manager to undertake the project within the organization.

Phase II: Developing Project Plan and Charter

- This phase involves detailed planning based on the project's size and complexity.
- The planning process is iterative and may require adjustments to budget, scope, schedule, or quality as needed.
- The project charter outlines project details, aligning with the company's vision and goals, and sets milestones and deadlines.

Phase III: Project Execution and Control

- During the execution phase, product-oriented processes are crucial.
- Quality assurance, risk management, and team development are core supporting activities.
- The controlling process ensures project activities stay on track, adhering to scope, budget, schedule, and quality parameters.
- This phase emphasizes monitoring and managing project progress.

Phase IV: Project Closure

- The closing process group's main objective is to bring the project to a successful conclusion and integrate it with the organization's operations.
- It ensures all project deliverables are completed, and contract terms are fulfilled.
- This phase marks the orderly completion of the project.

Phase V: Project Evaluation

- Project evaluation occurs after project completion and involves several parts.
- The first part reviews best practices used during the project in the organization's methodology.
- The second part assesses individual team members' and the project manager's performance.
- A neutral party conducts the third part, focusing on overall project performance and meeting client expectations.
- The final part determines whether the project delivered value to the organization.

c. What do you mean by Project Portfolio Management ? What are its elements?   (5)

Ans :

- 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. As is 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.
- Three key aspects of PPM are:

1. **Project Portfolio Definition:**

   -Record in a single repository details

2. **Project Portfolio Management:**

   -Details costing of projects and managers hope are recorded

   -Actual performance are tracked

3. **Project Portfolio Optimization:**

   -Better balance of project may be achieve

   -Profitable, but risky

   -Modest benefits, fewer risks

- **Elements are :-**
1. Official Project Title
2. Project Sponsor
3. Project Manager
4. Description Of The Project
5. Project Scope
6. Measurable Organizational Value(MOV)
7. Road Map For Work
8. Project Schedules
9. Project Budget
10. Project Resources
11. Assumptions And Constraints
12. Risks
13. Project Administration
14. Acceptance

d. How do you perform Cost Benefit Analysis(CBA)? (5)

Ans : Cost-Benefit Analysis (CBA) is a technique used in software project management to evaluate the potential benefits and costs of a project, helping decision-makers determine whether the project is financially viable. It involves identifying and quantifying all the relevant costs and benefits associated with the project to assess its overall profitability and make informed decisions about whether to proceed with the project or not.

- **how to perform Cost-Benefit Analysis using an example:**

Example: Consider a software development project aimed at creating a new mobile app for a retail company.

Step 1: Identify Costs and Benefits

Start by listing all the potential costs and benefits associated with the project.

Costs:

- Development Team Salaries
- Software and Hardware Costs
- Marketing and Promotion Expenses
- Maintenance and Support Costs
- Training Costs

Benefits:

- Increased Sales from Mobile App Users
- Cost Savings from Streamlined Processes
- Improved Customer Engagement and Loyalty
- Potential to Attract New Customers
- Competitive Advantage in the Market

Step 2: Assign Monetary Values

Assign monetary values to each cost and benefit. Some costs, like team salaries and software costs, will have clear monetary values. Benefits, on the other hand, might require more estimation. For example, the expected increase in sales can be based on market research and projected app usage.

Step 3: Calculate Net Benefits

Calculate the net benefits by subtracting the total costs from the total benefits.

Net Benefits = Total Benefits - Total Costs

Step 4: Calculate Benefit-Cost Ratio (BCR)

The Benefit-Cost Ratio is obtained by dividing the total benefits by the total costs. It helps in understanding whether the project's benefits outweigh the costs.

BCR = Total Benefits / Total Costs

Step 5: Analyze and Make a Decision

Based on the calculated net benefits and BCR, analyze the results to make an informed decision about the project's viability.

If the net benefits are positive, it indicates that the benefits outweigh the costs, and the project is financially viable.

If the BCR is greater than 1, it suggests that the project's benefits are greater than its costs, making it a good investment.

Example Calculation:

Let's assume the total costs of the project amount to $200,000 and the total benefits are estimated to be $400,000.

Net Benefits = $400,000 - $200,000 = $200,000
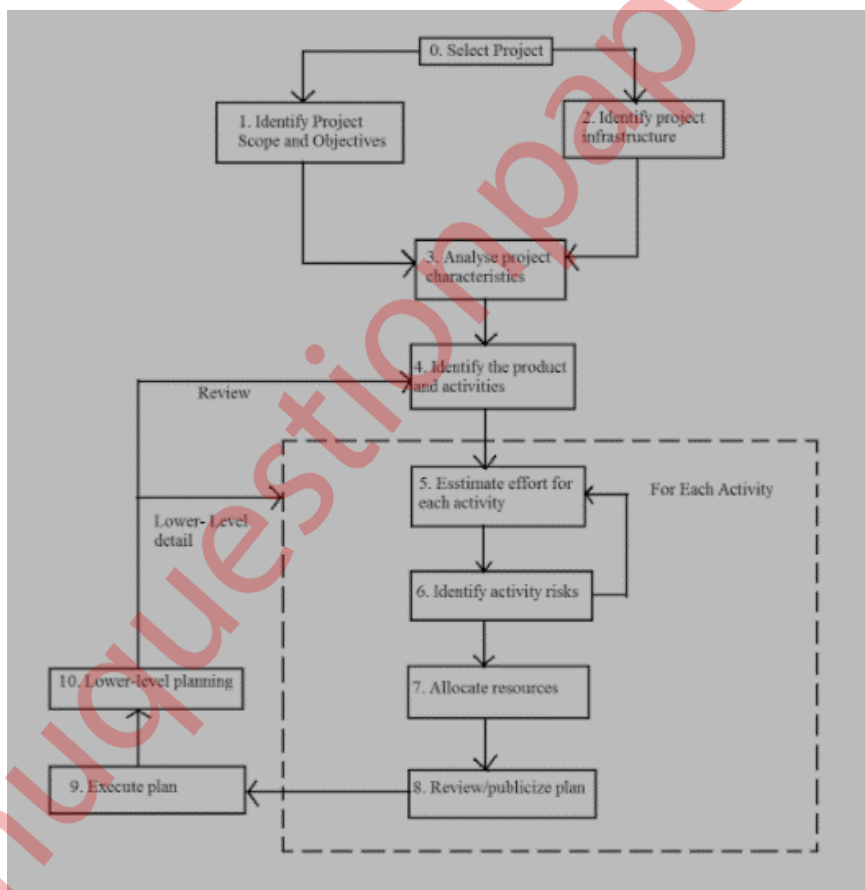
BCR = $400,000 / $200,000 = 2

Decision: In this example, the project has a positive net benefit of $200,000 and a BCR of 2, indicating that the benefits outweigh the costs, making it a financially viable project.

e. Draw the diagram of step wise approach to planning software projects and explain step

  1: Establish project scope and objectives in detail.   **(5)**

Ans :

Step 1: Identify Project Scope and Objectives

1.1. Identify objectives and practical measures of effectiveness in meeting those objectives. How do we know we are successful?

In this step, the project manager and the team identify the specific goals and objectives of the software project. These objectives should be well-defined, measurable, achievable, relevant, and time-bound (SMART criteria). These measures could be related to product functionality, quality, customer satisfaction, cost, or any other relevant aspect.

1.2. Establish a project authority. Who is the boss?

The project authority is the individual or group responsible for providing direction, oversight, and decision-making power for the project. The Project Manager collaborates with stakeholders, ensures resources are allocated appropriately, manages risks, and leads the project team throughout its lifecycle.

1.3. Stakeholder analysis – identify all stakeholders in the project and their interests. Who does what?

Stakeholder analysis is the process of identifying all individuals, groups, or entities that have an interest in the project or can be affected by its outcome. It involves understanding their roles, responsibilities, and influence on the project. This knowledge helps in managing expectations, resolving conflicts, and ensuring that the project aligns with the needs of all stakeholders.

1.4. Modify objectives in the light of stakeholder analysis. What shall we do for the commitment of stakeholders to the project?

Stakeholder analysis may reveal new insights or conflicting requirements, which can necessitate adjustments to the project's objectives. It is essential to consider the feedback and expectations of stakeholders to build their commitment to the project's success.

1.5. Establish methods of communication with all parties. How do we stay in touch and informed?

Effective communication is crucial for successful project management. In this step, the project manager and the team establish various communication channels and methods to stay in touch and keep all stakeholders informed about the project's progress.

f. Consider the cash flows estimates for four projects as shown in the table: Negative levels represent expenditure and positive values income. Rank the four projects in order of financial desirability and make a note of your reasons for ranking them in that way. Conclusion should be based on Net Profit, and ROI (Return On Investment) (5)

YEAR	PROJECT 1	PROJECT 2	PROJECT 3	PROJECT 4
0	-100000	-100000	-1000000	-120000
1	20000	20000	300000	30000
2	30000	30000	300000	30000
3	10000	20000	300000	30000
4	20000	20000	300000	30000
5	20000	30000	300000	50000
Net Profit	?	?	?	?
ROI	?	?	?	?

Ans :

- **Net Profit for Project 1: Sum of all cash flows over the years**

  Net Profit = (-100000) + 20000 + 30000 + 10000 + 20000 + 20000 = 80000

  ROI for Project 1:

  ROI = (Net Profit / Initial Investment) * 100

  ROI = (80000 / 100000) * 100 = 80%

- **Net Profit for Project 2: Sum of all cash flows over the years**

  Net Profit = (-100000) + 20000 + 30000 + 20000 + 20000 + 30000 = 20000

  ROI for Project 2:

  ROI = (Net Profit / Initial Investment) * 100

  ROI = (20000 / 100000) * 100 = 20%

- **Net Profit for Project 3: Sum of all cash flows over the years**

  Net Profit = (-1000000) + 300000 + 300000 + 300000 + 300000 + 300000 = 500000

  ROI for Project 3:

  ROI = (Net Profit / Initial Investment) * 100

  ROI = (500000 / 1000000) * 100 = 50%

- **Net Profit for Project 4: Sum of all cash flows over the years**

  Net Profit = (-120000) + 30000 + 30000 + 30000 + 30000 + 50000 = 58000

  ROI for Project 4:

  ROI = (Net Profit / Initial Investment) * 100

  ROI = (58000 / 120000) * 100 = 48.33%

- **Now, let's rank the projects based on financial desirability:**

  Project 3: It has the highest Net Profit (500000) and a moderate ROI of 50%.

  Project 1: It has the second-highest Net Profit (80000) and the highest ROI of 80%.

  Project 4: It has the third-highest Net Profit (58000) and a ROI of 48.33%.

  Project 2: It has the lowest Net Profit (20000) and the lowest ROI of 20%.

2. Attempt any three of the following:

a. What is Atern/Dynamic Systems Development Method? What are its eight core principles?   (5)

Ans : DSDM (formally known as Dynamic System Development Method) is an Agile method that focuses on the full project lifecycle. Dynamic System Development Method was created in 1994, after project managers using RAD (Rapid Application Development) sought more governance and discipline to this new iterative way of working.

The eight principles of DSDM are:

1) Focus on the business need

- Establish the business case through the business need perspective. Create a sound and justified business case
- Align the business case to organizational goals and priorities. Seek continuous business sponsorship.
- Validate the business commitment through results. Seek managerial/business input to align goals. Guarantee Minimum Usable Subset(MUST)
- Aim for the minimum usable state. Create a foundation to be built on it later iterations.

2) Deliver on Time

- Time box work activities / Always hit deadlines. Allocate time periods to complete work. Time boxing fixed periods of time for each planned activity.
- Hitting deadlines builds trust in a process. Develop priority conversations with a focus on what is needed.
- Hold conversations with business and project stakeholders to help determine timelines. Focus on what the business needs first to help meet organizational goals.

3) Collaborate

- Involve the right people at the right time. Bring in SME's and experts at points within the project when their experience can be best utilized.
- Actively involve business representatives. Gain business support through open communication.
- Invite business leaders to meetings and inquire about their thoughts on the current state and progress. Build a unified team through empowerment.
- Remove the top-down approach to project decisions. The project manager is there to serve as a guide to the process and a facilitator of communication, not the core decision make.

4) Never compromise quality

- Build in quality at the beginning. Decide as a team the minimum level of acceptable quality.
- Test early, test often, test continuously, test throughout the process to quality is being met.
- Continuously review quality goals and current level of quality. Review with the team on a regular basis the current level of quality and the current quality goals.
- Adjust goals as needed, but never sacrifice quality for time or extra features.

5) Build incrementally from firm foundations

- Confirm that solution is correct and meeting expectations. Hold conversations regularly to show the current solution state and allow for input from project stakeholders.
- Ensure the project is on right track and adjust as needed. Adjust and re-assess priorities and project viability. Decide on and focus on the priorities needed to build a firm foundation.
- Building a firm foundation will more easily allow for expansion of the project later in other iterations of the development process. Recognize that change may occur and adapt to it instead of fighting against it.

6) Develop iteratively

- Create the strong foundation, a strong solid base is easier to expand on later – you wouldn't want to build a house on top of a broken foundation.
- Try new things or look at things from a different perspective. Take others suggestion into consideration, recognize that the process is fluid and not locked in, try things first, experiment, be open to changes.
- Allow detail to merge later, rather than a strong detailed definition at the beginning. The project is being rough sketched in, as it progresses the sketch will become more detailed.

7) Communicate continuously and clearly

- Encourage effective and informal meetings, focus on the quality of the communication, encourage additional input and suggestions and engage in more collaborative practices.
- Use visual communication practices, use modelling or visual aids to help explain your point.
- Keep documentation lean, lots of documentation will never get read. Document enough to let others understand the basics.

8) Demonstrate control

- Results oriented project tracking. Rather than focus on completing each activity, focus on results, measure progress through delivery.
- Keep project state transparent and open to anyone who cares. Make planning documents available to all, project state should be openly and freely discussed.
- Proactively manage the project, continuously evaluating process, keep expectations in check, use an appropriately level of formatting when reported.

b. What are the Caper Jones Estimating Rules of Thumb ? **(5)**

Ans :

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 equivalent 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 Duration Estimation

- Function points 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

- 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. Basically, the rule states that the creep takes between the requirements phase till the testing phase and therefor only that part of the project should be considered.
- Going with previous example, if the size of the project is estimated to be 325 function points then the duration for the project is estimated to be 17 months. Since we need to exclude the duration of requirements and testing phase then the requirement creep will occur for 11 months.
- As per the rule 3 the original requirement will grow by three function point every month. So, the total requirements creep would be approximately 33 points and the total size of the project would be 325+33 = 358 function points.

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. Going by this rule when we have 358 function points for the projects the number of personnel
- required for the project would be 2.5 i.e. 3. However, while estimating the manpower requirement the complexity of the project, language used and the level of usage of CASE tools are not considered.

Rule 6: Software Development Effort Estimate

- The approximate number of staff members 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.

c. Explain Waterfall Model with the help of diagram. (5)

Ans :
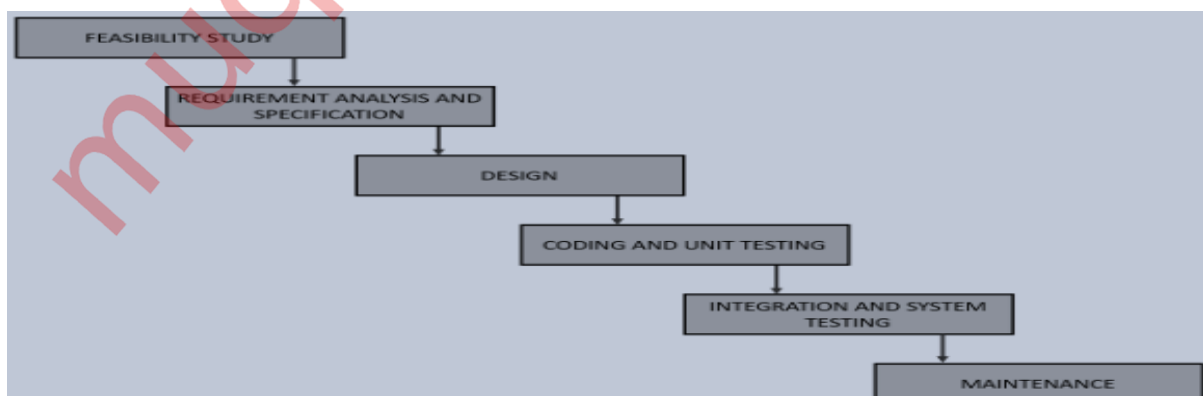
1. Feasibility Study

- The main goal of this phase is to determine whether it would be financially and technically feasible to develop the software.
- The feasibility study involves understanding the problem and then determining the various possible strategies to solve the problem. These different identified solutions are analysed based on their benefits and drawbacks. The best solution is chosen and all the other phases are carried out as per this solution strategy.

2. Requirements Analysis and Specification

The aim of the requirement analysis and specification phase is to understand the exact requirements of the customer and document them properly. This phase consists of two different activities.

- **Requirement gathering and analysis:**

   Firstly all the requirements regarding the software are gathered from the customer and then the gathered requirements are analysed. The goal of the analysis part is to remove incompleteness and inconsistencies.

- **Requirement specification:**

   These analysed requirements are documented in a software requirement specification (SRS) document. SRS document serves as a contract between the development team and customers. Any future dispute between the customers and the developers can be settled by examining the SRS document.

3. Design

The goal of this phase is to convert the requirements acquired in the SRS into a format that can be coded in a programming language. It includes high-level and detailed design as well as the overall software architecture. A Software Design Document is used to document all of this effort (SDD)

4. Coding and Unit Testing

In the coding phase software design is translated into source code using any suitable programming language. Thus each designed module is coded. The aim of the unit testing phase is to check whether each module is working properly or not.

5. Integration and System testing

Integration of different modules is undertaken soon after they have been coded and unit tested. Integration of various modules is carried out incrementally over a number of steps. During each integration step, previously planned modules are added to the partially integrated system and the resultant system is tested.

6. Maintenance

Maintenance is the most important phase of a software life cycle. The effort spent on maintenance is 60% of the total effort spent to develop a full software. There are basically three types of maintenance.

d. Explain Scrum. What do you understand by the term 'ceremonies' in a Scrum Project ?   (5)

Ans : Scrum is an efficient framework within which you can develop software with teamwork. It is based on agile principles. It is a framework for developing and sustaining complex products. Ken Schwaber and Jeff Sutherland developed Scrum. Together, they stand behind the Scrum Rules. Scrum is not a process or a technique for building products; rather, it is a framework within which you can employ various processes and techniques. Scrum makes the relative efficacy of your product management and development practices so that you can improve.

Scrum is:

- Lightweight
- Simple to understand
- Difficult to master
- Scrum has been used to develop software, hardware, embedded software, networks of interacting function, autonomous vehicles, schools, government, marketing, managing the operation of organizations and almost everything we use in our daily lives, as individuals and societies.
- In order to provide transparency and regular communication in the midst of such environments are held. Scrum ceremonies are meetings that are unique to scrum teams.
- Scrum is executed in what are called sprints, or short iterations of work lasting usually no more than two weeks.

The scrum ceremonies are outlined below:

1. **Sprint Planning:** This is where the team meets and decides what they need to complete in the coming sprint.
2. **Daily Scrum:** This is a stand up meeting, or a very short – 15-minute mini-meeting – for the team to make sure they are all on the same page.
3. **Sprint Review:** This is another type of meeting, but one in which the team demos what they shipped in the sprint.
4. **Sprint Retrospective:** This is when the team reviews their work, identifying what they did well and what didn't go as planned, so they can make the next sprint better.

e. Discuss the common problem faced during effort estimation.   (5)

Ans : Effort estimation in software project management is a crucial and challenging process that involves predicting the amount of time, resources, and cost required to complete a project successfully.

- There are several common problems faced during effort estimation:
1. **Unclear Project Requirements**: Inaccurate or incomplete project requirements can lead to flawed estimations. When project requirements are not well-defined, it becomes difficult to assess the scope and complexity of the work involved, resulting in inaccurate effort estimates.
2. **Lack of Historical Data:** Estimating effort becomes more reliable when historical data from similar projects is available. However, in the absence of such data, it becomes challenging to make accurate predictions based on past experiences.

3. **Inadequate Understanding of Technology:** If the project team lacks expertise or experience in the chosen technology stack, it can lead to underestimation of effort. Learning new technologies or tools during the project can cause delays and increase the overall effort required.

4. **Optimistic Bias:** Project team members or stakeholders might have an optimistic bias, leading them to underestimate the effort required. Unrealistic optimism can result in missed deadlines and over allocation of resources.

5. **Overlooking Non-Development Activities:** Effort estimation should not only consider the time spent on coding but also include other essential activities like testing, debugging, documentation, meetings, and project management. Failure to account for these activities can lead to underestimated effort.

6. **External Dependencies:** Projects often rely on external factors, such as third-party APIs or services, which may not be under the control of the project team. Delays or issues with these dependencies can significantly impact effort estimation.

7. **Changes in Project Scope:** As the project progresses, there might be changes in requirements, scope, or priorities. Failure to manage scope creep and incorporating these changes in the estimation can lead to inaccurate effort predictions.

8. **Inadequate Communication:** Poor communication between team members, stakeholders, and project managers can lead to misunderstandings and misinterpretations of requirements, leading to inaccurate estimates.

9. **Estimation Techniques:** Choosing the right estimation technique is essential. Relying on a single estimation method, without considering the project's specific characteristics, can result in inaccurate estimations.

10. **Time Constraints:** Sometimes, project managers are under pressure to provide quick estimates without sufficient time for analysis and consideration, leading to rushed and potentially inaccurate estimates.

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f. Write a note on Albert Function/IFPUG. (5)

Ans : Albrecht Function Point Analysis (FPA) is a method used in software project management to measure and estimate the size and complexity of a software system based on the functionality it provides. FPA considers five major components to assess the software's functionality and determine the function points:

- **External Input (EI) types:**

External Inputs are the transactions in which the system receives data from the user or an external entity and uses that data to update the internal computer files. These inputs typically involve data validation, processing, and storage. Examples could include user registration, data entry, or any operation where data is accepted and processed by the system.

- **External Output (EO) types:**

External Outputs represent transactions that provide information to the user or external systems. These outputs involve extracting and displaying data from the internal computer files in the form of reports, messages, or other forms of data presentation. Examples

include generating reports, displaying search results, or presenting data to external interfaces.

- **External Inquiry (EQ) types:**

External Inquiries are user-initiated transactions that provide information to the user but do not update the internal computer files. The system responds to user queries by fetching and presenting data without modifying it. EQ transactions typically involve data retrieval and display, such as displaying a user's account balance or providing product information.

- **Logical Interface File (LIF) types:**

Logical Interface Files represent data stores within the software system. These files serve as intermediaries between external inputs and outputs, allowing the system to manage and store data effectively. LIFs can be thought of as analogous to data stores in systems analysis terms.

- **External Interface File (EIF) types:**

External Interface Files represent data stores external to the software system but accessed and utilized by the target system. These files are maintained and managed by different applications or systems. EIFs enable the software to interact with other systems and retrieve necessary data. Examples include accessing a customer database maintained by another application.

3. Attempt any three of the following:

a. Differentiate between PERT (Program Evaluation Review Technique) and CPM (Critical Path Method). (5)

Ans :

S.No.	PERT	CPM
1	PERT is that technique of project management which is used to manage uncertain (i.e., time is not known) activities of any project.	CPM is that technique of project management which is used to manage only certain (i.e., time is known) activities of any project.
2	It is event oriented technique which means that network is constructed on the basis of event.	It is activity oriented technique which means that network is constructed on the basis of activities.
3	It is a probability model.	It is a deterministic model.
4	It majorly focuses on time as meeting time target or estimation of percent completion is more important.	It majorly focuses on Time-cost trade off as minimizing cost is more important.
5	It is appropriate for high precision time estimation.	It is appropriate for reasonable time estimation.
6	It has Non-repetitive nature of job.	It has repetitive nature of job.
7	There is no chance of crashing as there is no certainty of time.	There may be crashing because of certain time boundation.
8	It doesn't use any dummy activities.	It uses dummy activities for representing sequence of activities.
9	It is suitable for projects which required research and development.	It is suitable for construction projects.

b. Define Risk Management. Explain the different Categories of Risk. **(5)**

Ans : The Risk Management Framework specifies accepted best practice for the discipline of risk management. It is implementation independent – it defines key risk management activities, but does not specify how to perform those activities. In particular, the framework helps provide a foundation for a comprehensive risk management methodology basis for evaluating and improving a program's risk management practice.

Categories of Risk :

1. Schedule Risk :

Schedule related risks refers to time related risks or project delivery related planning risks. The wrong schedule affects the project development and delivery. These risks are mainly indicates to running behind time as a result project development doesn't progress timely and it directly impacts to delivery of project.

2.Budget Risk :

Budget related risks refers to the monetary risks mainly it occurs due to budget overruns. Always the financial aspect for the project should be managed as per decided but if financial aspect of project mismanaged then there budget concerns will arise by giving rise to budget risks.

3.Operational Risks :

Operational risk refers to the procedural risks means these are the risks which happen in day-to-day operational activities during project development due to improper process implementation or some external operational risks.

4.Technical Risks :

Technical risks refers to the functional risk or performance risk which means this technical risk mainly associated with functionality of product or performance part of the software product.

5.Programmatic Risks :

Programmatic risks refers to the external risk or other unavoidable risks. These are the external risks which are unavoidable in nature. These risks come from outside and it is out of control of programs.

c. State and Describe the Burman's priority list in project management. **(5)**

Ans : In project management, the Burman's priority list is a prioritization technique used to determine the order in which different activities should be performed during the project execution. It helps project managers focus on critical tasks and allocate resources efficiently to ensure project success.

The prioritization is based on the following criteria:

Shortest Critical Activities:

Critical activities are those tasks in the project that directly impact the project's overall duration. They must be completed within a specific time frame to avoid project delays. The first priority in the Burman's list goes to the shortest critical activities. By prioritizing these tasks, the project manager ensures that the most time-sensitive and crucial activities are addressed first.

Other Critical Activities:

After the shortest critical activities have been identified and prioritized, the next priority goes to the remaining critical activities in the project. These are also tasks that significantly influence the project timeline and must be managed effectively to prevent any potential delays.

Shortest Non-Critical Activities:

Non-critical activities are tasks that, if delayed, do not affect the overall project duration. However, they may still be important for other reasons, such as resource availability or dependency on other activities.

Non-Critical Activities with Least Float:

Float (also known as slack) represents the amount of time a non-critical activity can be delayed without affecting subsequent tasks or the project's overall duration. The next priority in the Burman's list is given to non-critical activities with the least float.

Non-Critical Activities:

Finally, the last priority goes to the remaining non-critical activities that do not fall into the previous categories. While these tasks are not time-sensitive, they are still essential for project completion and should not be ignored.

d. What are the Boehm's Top 10 Development Risks? **(5)**

Ans :

| No.	Risk Item	Risk Management Techniques
1	Personnel shortfalls	Staffing with top talent, job matching; teambuilding; morale building; cross-training; pre-scheduling key people
2	Unrealistic schedules and budgets	Detailed, multisource cost and schedule estimation; Design to cost; incremental development; software reuse; requirements scrubbing
3	Developing the wrong software functions	Organization analysis; mission analysis; ops-concept formulation; user surveys; prototyping; early users' manuals
4	Developing the wrong user interface	Task analysis; prototyping; scenarios; user characterization (functionality, style, workload)
5	Gold plating	Requirements scrubbing prototyping; cost-benefit analysis; design to cost
6	Continuing stream of requirement changes externally furnished components	High change threshold; information hiding; incremental development (defer changes to later increments)
7	Shortfalls in computer-science capabilities	Benchmarking; inspections; reference checking; compatibility analysis
8	Shortfalls in externally performed tasks	Reference checking; pre-award audits; award-fee contracts; competitive design or prototyping; teambuilding
9	Real-time performance shortfalls	Simulation; benchmarking; modeling; prototyping; instrumentation; tuning
10	Straining Computer-science capabilities	Technical analysis; cost-benefit analysis; prototyping; reference checking

e. Draw CPM and Determine the Critical Path, the critical activities and the project completion time, for the following activities. (5)

Activity	Predecessor Activity	Duration(weeks)
A	-	3
B	A	5
C	A	7
D	B	10
E	C	5
F	D,E	4

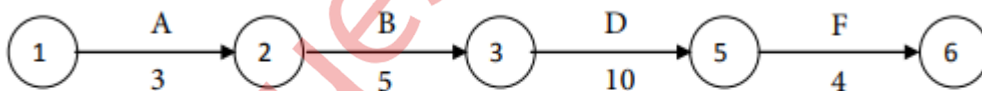**Ans :** Determine the critical path, the critical activities and the project completion time.

Solution

First let us construct the network diagram for the given project. We mark the time estimates along the arrows representing the activities. We obtain the following diagram:
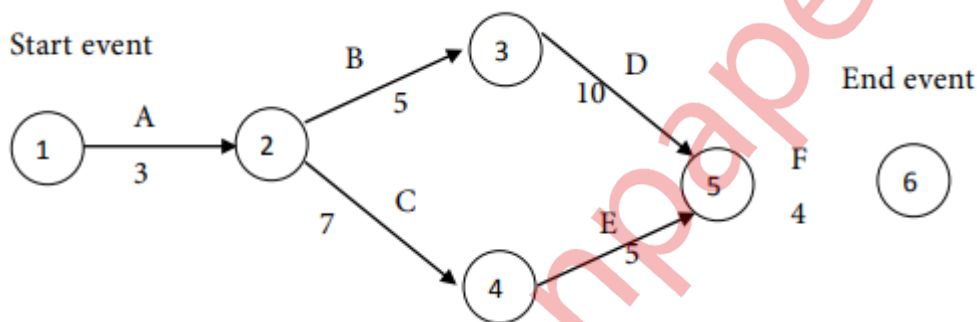
Consider the paths, beginning with the start node and stopping with the end node. There are two such paths for the given project. They are as follows:

Path I :

with a time of $3 + 5 + 10 + 4 = 22$ weeks.

Path 2 :

with a time of $3 + 7 + 5 + 4 = 19$ weeks.

Compare the times for the two paths. Maximum of {22,19} = 22. We see that path I has the maximum time of 22 weeks. Therefore, path I is the critical path. The critical activities are A, B, D and F. The project completion time is 22 weeks. We notice that C and E are non- critical activities. Time for path I - Time for path II = 22- 19 = 3 weeks. Therefore, together the non-critical activities can be delayed up to a maximum of 3 weeks, without delaying the completion of the whole project.
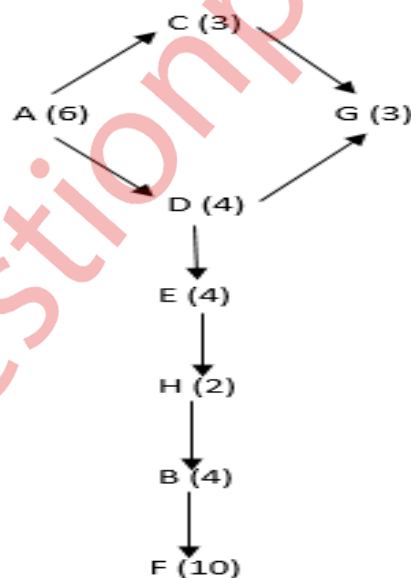
f. Draw PERT Network using precedence network conventions for the project in table. Also show stepwise activities of forward pass and backward pass. **(5)**

Ans :

Activity	Duration	Precedents
A	6	-
B	4	-
C	3	A
D	4	B
E	4	B
F	10	-
G	3	E,F
H	2	C,D

Ans :

PERT Diagram :

1.Forward Pass (Early Start and Early Finish):

The forward pass calculates the earliest possible start and finish times for each activity.

Stepwise Activities of Forward Pass**:**

Step 1: Activity A (6)

A starts at 0 (since it has no predecessors)

A finishes at 0 + 6 = 6

Step 2: Activity B (4)

B starts at 6 (since it has no predecessors)

B finishes at 6 + 4 = 10

Step 3: Activity C (3)

C starts at max(6, 10) = 10 (since it depends on A and B, choose the maximum finish time)

C finishes at 10 + 3 = 13

Step 4: Activity D (4)

D starts at max(6, 10) = 10 (since it depends on A and B, choose the maximum finish time)

D finishes at 10 + 4 = 14

Step 5: Activity E (4)

E starts at 14 (since it depends on D)

E finishes at 14 + 4 = 18

Step 6: Activity H (2)

H starts at max(13, 14) = 14 (since it depends on C and D, choose the maximum finish time)

H finishes at 14 + 2 = 16

Step 7: Activity G (3)

G starts at max(18, 13) = 18 (since it depends on E and max(H, C), choose the maximum finish time)

G finishes at 18 + 3 = 21

Step 8: Activity F (10)

F starts at 21 (since it depends on G)

F finishes at 21 + 10 = 31

2.Backward Pass (Late Start and Late Finish):

The backward pass calculates the latest possible start and finish times for each activity.

Stepwise Activities of Backward Pass:

Step 1: Activity F (10)

F finishes at 31 (since it has no successors)

F starts at 31 - 10 = 21

Step 2: Activity G (3)

G finishes at 31 (since it depends on F)

G starts at 31 - 3 = 28

Step 3: Activity H (2)

H finishes at 31 (since it depends on G)

H starts at 31 - 2 = 29

Step 4: Activity E (4)

E finishes at 28 (since it depends on G)

E starts at 28 - 4 = 24

Step 5: Activity D (4)

D finishes at min(29, 24) = 24 (since it depends on H and E, choose the minimum start time)

D starts at 24 - 4 = 20

Step 6: Activity C (3)

C finishes at min(29, 24) = 24 (since it depends on H and E, choose the minimum start time)

C starts at 24 - 3 = 21

Step 7: Activity B (4)

B finishes at 20 (since it depends on D)

B starts at 20 - 4 = 16

Step 8: Activity A (6)

A finishes at 21 (since it depends on C)

A starts at 21 - 6 = 15

4. Attempt any three of the following:

a. Define the any three term following:- i) Schedule Variance ii) Cost Variance iii) Earned Value iv) Schedule performance Index v) Cost performance index. **(5)**

i) Schedule Variance

- Schedule Variance (SV) is a term for the difference between the earned value (EV) and the planned value (PV) of a project. It is used a measure of the variance analysis that forms an element the earned value management techniques. An alternative but less common classification of this technique is earned schedule management or analysis.
- The schedule variance indicates whether the performance i.e. the authorized work performed exceeds, falls below or is equal to the planned performance.

ii) Cost Variance

Cost Variance (CV) is an indicator of the difference between earned value and actual costs in a project. It is a measure of the variance analysis technique which is a part of the earned value management methodology.

iii) Earned Value

Earned value management (EVM) is a systematic process used to measure project performance at various times throughout a project life cycle. EVM helps project managers to determine whether a project is over or under budget, or if the project is on schedule.

iv) Schedule performance index

The Schedule Performance Index is a measure of project efficiency given by Project Management to gauge the progress and efficiency. A Schedule Performance Index score of 1 or greater is an optimum goal since it shows the Project Management that the project is on track and has favourable conditions of meeting the required goals.

v) Cost performance index

The cost performance index or CPI is a measure of how well the project is doing in terms of spending the project budget. It is a comparison of the actual expenditures to the work that was accomplished. The index is a value that allows projects of different sizes to be compared.

b. What is Contract? Explain the advantages and disadvantages of fixed price-contracts. (5)

Ans : Contracts are used for establishing business deals and partnerships. The parties involved in the business engagement decide the type of the contract. Usually, the type of the contract used for the business engagement varies depending on the type of the work and the nature of the industry.

Advantages of Fixed Price Contracts:

- **Budget Certainty:** One of the main advantages of fixed price contracts is that they provide budget certainty to the client. Since the price is agreed upon before the project starts, the client knows exactly how much they will have to pay, allowing for better financial planning.
- **Reduced Client Risk:** Fixed price contracts shift the risk from the client to the software development company. The development company is responsible for managing the project efficiently and delivering the agreed-upon scope within the fixed budget.
- **Simplified Contract Management**: Fixed price contracts are usually simpler to manage because the terms and conditions are well-defined, leaving less room for disputes and changes during the project.
- **Incentive for Efficiency:** Since the development company has a fixed budget, they are incentivized to be efficient in their work and find ways to deliver the project within the agreed-upon cost.

Disadvantages of Fixed Price Contracts:

- **Limited Flexibility:** Fixed price contracts offer little room for changes in project scope or requirements. If the client wants to make changes during the development process, it can lead to additional costs and potential conflicts.
- **Scope Creep Impact:** Scope creep, which refers to the gradual expansion of project scope beyond what was originally agreed upon, can be problematic in fixed price contracts. Dealing with scope changes can be challenging and may require negotiation and additional costs.
- **Quality Concerns:** In some cases, the development company may be incentivized to cut corners to meet the fixed budget, potentially compromising the overall quality of the software product.

- **Uncertainty for the Vendor:** Fixed price contracts can be risky for the software development company, especially if the project's requirements are unclear or change significantly during the development process. This could lead to profit losses or disputes.

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c. Explain general recruitment process. **(5)**

Ans : Recruitment is a process of finding and attracting the potential resources for filling up the vacant positions in an organization.

It sources the candidates with the abilities and attitude, which are required for achieving the objectives of an organization.

Recruitment process is a process of identifying the jobs vacancy, analysing the job requirements, reviewing applications, screening, shortlisting and selecting the right candidate.

These five practices ensure successful recruitment without any interruptions. In addition, these practices also ensure consistency and compliance in the recruitment process.

RECRUITMENT PROCESS
- Recruitment Planning
- Strategy Development
- Searching
- Screening
- Evaluation & Control

Recruitment Planning −

- Recruitment planning is the first step of the recruitment process, where the vacant positions are analysed and described. It includes job specifications and its nature, experience, qualifications and skills required for the job, etc.
- A structured recruitment plan is mandatory to attract potential candidates from a pool of candidates.
- The potential candidates should be qualified, experienced with a capability to take the responsibilities required to achieve the objectives of the organization.
- The first and foremost process of recruitment plan is identifying the vacancy. This process begins with receiving the requisition for recruitments from different department of the organization to the HR
- Department, which contains –
1. Number of posts to be filled
2. Number of positions
3. Duties and responsibilities to be performed
4. Qualification and experience required

Strategy Development

- Recruitment strategy is the second step of the recruitment process, where a strategy is prepared for hiring the resources.
- While preparing a recruitment strategy, the HR team considers the following points –
1. Make or buy employees
2. Types of recruitment
3. Geographical area
4. Recruitment sources
- The development of a recruitment strategy is a long process, but having a right strategy is mandatory to attract the right candidates. The steps involved in developing a recruitment strategy include –
1. Setting up a board team
2. Analyzing HR strategy
3. Collection of available data
4. Analyzing the collected data
5. Setting the recruitment strategy

Searching

- Searching is the process of recruitment where the resources are sourced depending upon the
- requirement of the job. After the recruitment strategy is done, the searching of candidates will be initialized. This process consists of two steps –
- Source activation – Once the line manager verifies and permits the existence of the vacancy,
- the search for candidates starts.
- Selling – Here, the organization selects the media through which the communication of
- vacancies reaches the prospective candidates.
- Searching involves attracting the job seekers to the vacancies. The sources are broadly divided into two categories: Internal Sources and External Sources.
- **Internal sources of recruitment refer to hiring employees within the organization through –**
1. Promotions
2. Transfers
3. Former Employees
4. Internal Advertisements (Job Posting)
5. Employee Referrals
6. Previous Applicants
- **External sources of recruitment refer to hiring employees outside the organization through –**
1. Direct Recruitment
2. Employment Exchanges
3. Employment Agencies
4. Advertisements
5. Professional Associations
6. Campus Recruitment

Screening

- Screening starts after completion of the process of sourcing the candidates. Screening is the process of filtering the applications of the candidates for further selection process.
- Screening is an integral part of recruitment process that helps in removing unqualified or irrelevant candidates, which were received through sourcing.
- In this process, the resumes of the candidates are reviewed and checked for the candidates' education, work experience, and overall background matching the requirement of the job.
- HR executive must keep the following points in mind, to ensure better screening of the potential candidates –
1. Reason for change of job
2. Long gaps in employment
3. Job-hopping
4. Lack of career progression

Evaluation and Control

- Evaluation and control is the last stage in the process of recruitment. In this process, the effectiveness and the validity of the process and methods are assessed. Recruitment is a costly process, hence it is important that the performance of the recruitment process is thoroughly evaluated.
- The costs incurred in the recruitment process are to be evaluated and controlled effectively.
- These include the following –
1. Salaries to the Recruiters
2. Advertisements cost and other costs incurred in recruitment methods, i.e., agency fees.
3. Administrative expenses and Recruitment overheads
4. Overtime and Outstanding costs, while the vacancies remain unfilled
5. Cost incurred in recruiting suitable candidates for the final selection process
6. Time spent by the Management and the Professionals in preparing job description, job specifications, and conducting interviews.

d. What are the five basics stages of Team Development ?   **(5)**

Ans :

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Forming	Storming	Norming	Performing	Adjourning

Forming: In the forming stage, team members come together for the first time. They are often polite and cautious, trying to understand each other's personalities, skills, and roles within the team. During this phase, the team's objectives are usually discussed, and members may seek clarification about their roles and responsibilities.

Storming: In the storming stage, conflicts and disagreements start to arise as team members have different ideas, approaches, and opinions. This stage can be challenging as individuals compete for influence and try to establish their positions within the team. Effective team leaders must guide the group through this phase, helping to resolve conflicts constructively and foster a collaborative atmosphere.

Norming: During the norming stage, the team starts to establish norms, rules, and values that govern how they interact and work together. The group becomes more cohesive as trust and mutual respect develop. Team members start to understand each other's strengths and weaknesses, and they begin to collaborate more effectively towards achieving the project's objectives.

Performing: The performing stage is when the team reaches its peak productivity. At this point, team members have resolved most conflicts, and they are fully engaged in their roles. The team demonstrates a high level of synergy and can tackle complex challenges efficiently. In this stage, the team is focused on achieving its goals and delivering results.

Adjourning (or sometimes called "Mourning" or "Transforming"): This stage occurs when the project comes to an end or the team disbands. Team members might feel a sense of accomplishment if they have been successful in achieving their goals. Alternatively, they might experience sadness or loss if the project didn't meet expectations or if they bonded strongly as a team. In some cases, the adjourning stage can be a time for celebration and recognition of the team's efforts and achievements.

e. What is Stress? Explain Stress Management. (5)

Ans : Stress Management in software project management is the process of identifying, addressing, and mitigating stress factors to ensure a healthy and productive work environment. Effective stress management aims to help team members cope with the demands of the project, reduce the negative effects of stress, and enhance overall project outcomes. Here are some strategies for stress management in software project management:

Recognize and acknowledge stress: The first step is to recognize the signs of stress in team members. Encourage open communication within the team, so individuals feel comfortable expressing their concerns.

Set realistic goals and expectations: Unrealistic deadlines or goals can lead to undue stress. Ensure that project milestones and timelines are achievable and allow sufficient time for unforeseen challenges.

Effective project planning: A well-organized project plan with clear tasks, responsibilities, and timelines can help in distributing the workload and managing resources effectively.

Communication: Promote open and transparent communication among team members, stakeholders, and project managers. Regularly update everyone on project progress, changes, and challenges, fostering a supportive team environment.

Work-life balance: Encourage a healthy work-life balance by promoting regular breaks, vacations, and respecting personal boundaries. Overworking for extended periods can lead to burnout and reduced productivity.

Support and resources: Ensure that team members have access to the necessary tools, resources, and training required to perform their tasks effectively. Lack of proper resources can lead to frustration and stress.

Delegation: Avoid burdening specific individuals with excessive responsibilities. Distribute tasks evenly based on team members' skills and expertise.

Training and skill development: Invest in training and skill development opportunities for team members. Enhancing their abilities can boost confidence and reduce stress related to unfamiliar tasks.

Encourage stress-relief activities: Support stress-relief activities, such as team-building exercises, mindfulness sessions, or physical activities, to help team members unwind and recharge.

Monitor workload: Regularly assess the workload of team members to identify potential signs of overload and redistribute tasks if necessary.

f. Describe the Ethical and Professional Concern. (5)

Ans : In software project management, ethical and professional concerns are critical considerations that address the moral and responsible aspects of managing software projects. Below are some key ethical and professional concerns in software project management:

Customer Privacy and Data Protection: Handling sensitive data, such as user information, requires strict adherence to data protection laws and ethical guidelines. Project managers must ensure that data is collected, stored, and processed securely and responsibly, safeguarding the privacy and confidentiality of users and stakeholders.

Transparency and Accountability: Project managers should maintain transparency in their actions and decisions, keeping stakeholders informed about project progress, challenges, and risks.

Intellectual Property Rights: Respecting intellectual property rights is essential. Project managers must ensure that software development doesn't infringe on copyrights, patents, or trademarks of other individuals or organizations.

Fair and Inclusive Practices: Software project managers should promote fairness and inclusivity within the project team and avoid any form of discrimination or bias. Creating a diverse and inclusive work environment fosters innovation and enhances team collaboration.

Avoiding Conflicts of Interest: Project managers should identify and manage potential conflicts of interest that could compromise the project's integrity or impartiality. They should prioritize the interests of the project and its stakeholders over personal or external interests.

Quality Assurance and Testing: Delivering a high-quality product is crucial for ethical software project management. Ensuring that the software is rigorously tested, meets specifications, and performs as expected helps prevent potential harm to users or clients.

Responsible Project Scope and Deadlines: Setting realistic project scope and deadlines is essential to prevent undue stress on the team and maintain a healthy work-life balance.

5. Attempt any three of the following:

a. What are the different type of Team Structure ? (5)

Ans :

1. **Problem – Solving Teams:**
   - This kind of team basically comprises of a few members, ideally from 5 to 12, belonging to a particular department coming together on a weekly basis to discuss and solve problems of their department functioning.
   - Members give their individual suggestions for process improvement and after enough deliberation, present their advice to the higher management for further implementation.
   - For example, Merrill Lynch, in the earlier days had created a problem-solving team to figure out a way to reduce the time taken to open a new cash management account.

2. **Self – Managed Teams:**
   - While problem-solving teams were effective in recommending solutions, they didn't have the power to implement them.
   - Self-managed teams were built to address this challenge and apart from discussing issues, they were responsible for implementing the solutions and taking responsibilities for their outcomes.
   - From making operational decisions to interacting with customers, self-managed teams are highly effective provided the members are motivated and driven to bring about positive change.

3. **Cross – Functional Teams:**
   - When employees from different business functions but belonging to a similar hierarchical level come together to achieve a common task, the team is called a cross-functional team.
   - The members bring their individual expertise from their respective work area and exchange information for a common cause.
   - Whether it is finding solution to a development fault or coordinating complex projects, cross-functional teams are very effective if managed well.

4. **Virtual Teams:**
   - In today's world of internet and mobile technologies, it's easier to manage physically dispersed members with the concept of building virtual teams. Members collaborate online, participate in video conferences and discuss in real-time to realize a common objective.
   - While virtual teams are easily manageable, the members sometime lack the motivation to find solutions or fail to trust each other due to absence of any direct interaction.
   - These challenges must be addressed by monitoring the efforts of the members and recognizing their individual contributions

b. What is CMM(Capability Maturity Model)? What are the various levels of CMM? (5)

Ans : 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.

c. What is ISO Standard? What are the sub characteristics of Functionality and Reliability of ISO 9126 Software Qualities? (5)

Ans : ISO 9126 is an international standard for the evaluation of software. The standard is divided into four parts which addresses, respectively, the following subjects: quality model; external metrics; internal metrics; and quality in use metrics.

The ISO 9126–1 software quality model identifies 6 main quality characteristics, namely:

1. **Functionality:**
- Functionality is the essential purpose of any product or service. For certain items this is relatively easy to define, for example a ship's anchor has the function of holding a ship at a given location.
- The more functions a product has, e.g. an ATM machine, then the more complicated it becomes to define its functionality. For software a list of functions can be specified, i.e. a sales order processing systems should be able to record customer information so that it can be used to reference a sales order.
2. **Reliability:**
- Once a software system is functioning, as specified, and delivered the reliability characteristic defines the capability of the system to maintain its service provision under defined conditions for defined periods of time.

- One aspect of this characteristic is fault tolerance that is the ability of a system to withstand component failure. For example, if the network goes down for 20 seconds then comes back the system should be able to recover and continue functioning.

3. **Usability:**
- Usability only exists with regard to functionality and refers to the ease of use for a given function.
- For example, a function of an ATM machine is to dispense cash as requested. Placing common amounts on the screen for selection, i.e. $20.00, $40.00, $100.00 etc, does not impact the function of the ATM but addresses the Usability of the function. The ability to learn how to use a system (learnability) is also a major sub-characteristic of usability.

4. **Efficiency:**
- This characteristic is concerned with the system resources used when providing the required

  functionality. The amount of disk space, memory, network etc. provides a good indication of this characteristic.

- As with a number of these characteristics, there are overlaps. For example, the usability of a system is influenced by the system's Performance, in that if a system takes 3 hours to respond the system would not be easy to use although the essential issue is a performance or efficiency characteristic.

5. **Maintainability:**
- The ability to identify and fix a fault within a software component is what the maintainability characteristic addresses.
- In other software quality models this characteristic is referenced as supportability. Maintainability is impacted by code readability or complexity as well as modularization.

6. **Portability:**
- This characteristic refers to how well the software can adopt to changes in its environment or with its requirements.
- The sub characteristics of this characteristic include adaptability. Object oriented design and implementation practices can contribute to the extent to which this characteristic is present in a given system.

d. What are the five basics stages of Team Management? (5)

Ans :

1. **Problem – Solving Teams:**
- This kind of team basically comprises of a few members, ideally from 5 to 12, belonging to a particular department coming together on a weekly basis to discuss and solve problems of their department functioning.
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- While virtual teams are easily manageable, the members sometime lack the motivation to find solutions or fail to trust each other due to absence of any direct interaction.
- These challenges must be addressed by monitoring the efforts of the members and recognizing their individual contributions

e. What is Testing? Explain Test Plan and Test Management?   (5)

Ans: In software project management, testing is a crucial process used to assess the quality, functionality, and reliability of a software product. It involves executing the software under controlled conditions to identify defects, errors, or any areas where the application does not meet its specified requirements. The primary goal of testing is to ensure that the software performs as expected and meets the user's needs.

Test Plan:

- A test plan is a formal document that outlines the approach, objectives, scope, resources, and schedule for testing a software application. It acts as a roadmap for the testing process and provides a detailed overview of how testing activities will be carried out during the project.
- The test plan typically includes the following components:
- **Test Scope:** Defines the boundaries and limitations of the testing process, specifying what will be tested and what will not be tested.
- **Test Objectives:** States the goals and purpose of the testing effort, such as identifying defects, validating functionality, or ensuring compliance with requirements.
- **Test Strategy:** Describes the overall approach to testing, including the types of testing to be performed (e.g., unit testing, integration testing, system testing, acceptance testing).

- **Test Environment:** Specifies the hardware, software, and other resources required to conduct testing effectively.
- **Test Schedule:** Outlines the timeline for various testing activities, including start and end dates for each testing phase.
- **Test Deliverables:** Lists the documents and artefact's to be produced as a result of the testing process, such as test cases, test scripts, defect reports, etc.
- **Test Risks and Contingencies:** Identifies potential risks that may impact the testing process and outlines contingency plans to mitigate them.
- **Test Execution and Reporting:** Explains how test results will be recorded, tracked, and reported to stakeholders.
- **Roles and Responsibilities:** Clearly defines the responsibilities of each team member involved in the testing process.

- **Test Management:**
- Test management involves the planning, monitoring, and control of the testing activities throughout the software development lifecycle. It encompasses the coordination of resources, tools, and processes to ensure that testing is executed efficiently and effectively.
- Key aspects of test management include:
- **Test Planning:** Creating the test plan and defining the testing strategy, objectives, and scope.
- **Test Design:** Developing test cases and test scenarios based on the software requirements and design specifications.
- **Test Execution:** Running the test cases and recording the outcomes, which involves identifying and reporting defects**.**
- **Test Monitoring and Control**: Keeping track of testing progress, analyzing test metrics, and making adjustments as needed to meet the testing goals.
- **Defect Management**: Managing the process of defect identification, reporting, tracking, and resolution.
- **Test Automation:** Implementing automated testing tools and frameworks to increase test coverage and efficiency.
- **Test Reporting:** Communicating test results to stakeholders, highlighting the testing status, and making recommendations for the software's release readiness.
- **Test Closure:** Evaluating the completion criteria, gathering lessons learned, and preparing testing-related documentation for future reference.

f. What do you mean by Premature Termination? What are the reasons for projects Premature Termination ? **(5)**

Ans : "Premature Termination" refers to the abrupt ending of a project before it reaches its intended completion or desired outcome. This can happen at any stage of the project, from the initiation phase to the closing phase. Premature Termination can have significant consequences for the project team, stakeholders, and the organization as a whole.

Reasons for Premature Termination of software projects can be varied and may include:

Budget Constraints: Insufficient funding or budget cuts during the project lifecycle can lead to the termination of the project.

Scope Creep: If the project's scope keeps expanding beyond the initial plan without proper management and control, it can lead to resource exhaustion and premature termination.

Inadequate Planning: Projects that are not well-planned or lack a clear roadmap are more likely to encounter roadblocks and difficulties that may eventually result in termination.

Changing Priorities or Business Environment: Changes in business strategies, organizational priorities, or external factors can render the project irrelevant or unfeasible, leading to its termination.

Technological Challenges: Unforeseen technical difficulties or problems that are too costly or time-consuming to address can force project termination.

Resource Constraints: If the project lacks essential resources such as skilled personnel, technology, or equipment, it may become unviable and get terminated.

Poor Project Management: Ineffective project management practices, including lack of communication, inadequate risk management, or insufficient progress monitoring, can contribute to project failure.

Stakeholder Issues: Conflicts among stakeholders, loss of support from key stakeholders, or disagreements about project goals can lead to premature termination.

Legal or Compliance Issues: Projects that face legal challenges or fail to meet regulatory compliance requirements may be forced to terminate.

Vendor or Supplier Issues: Projects relying heavily on external vendors or suppliers may face termination if these third parties fail to deliver as expected.

Natural or Man-made Disasters: Catastrophic events such as natural disasters or major accidents can disrupt the project and lead to its termination.