Q.1 (a) What is project estimation? Explain COCOMO estimation model.

Ans.: Project estimation, in simple terms, is the process of making educated guesses about how long a project will take, how much it will cost, and what resources are needed to complete it. It's like trying to predict the future of a project by looking at the tasks and factors involved. Accurate estimation is important for planning and managing projects effectively.

COCOMO, which stands for "Constructive Cost Model," is a well-known software cost estimation model developed by Dr. Barry Boehm in the 1980s. It's used to estimate the cost, effort, and schedule of a software development project. The COCOMO model has evolved over the years, and there are different versions, but the two main models are COCOMO I and COCOMO II

Here's an overview of the COCOMO II model, which is the more recent and widely used version:

1. Basic COCOMO: COCOMO II consists of three levels of estimation. The first level, Basic COCOMO, is used for early and quick estimates. It's based on the size of the software (measured in source lines of code, or SLOC) and estimates the effort and schedule required for the project.

2. Intermediate COCOMO: The Intermediate COCOMO is the second level and provides a more detailed estimate by considering various software attributes and development characteristics. It takes into account factors like product complexity, hardware constraints, personnel capabilities, and more.

3. Detailed COCOMO: The third level, Detailed COCOMO, offers the most detailed estimation and considers a broader range of factors, including those specific to the project, organization, and development environment. This level aims to provide highly accurate and fine-grained estimates.

COCOMO II uses mathematical equations and coefficients to estimate effort and schedule based on the project's characteristics and size. The model takes into account factors such as personnel capability, software reuse, documentation, and other project-specific parameters to calculate estimates.

COCOMO II is a widely recognized and used model for software project estimation, and it helps project managers, software developers, and stakeholders make informed decisions about project planning, resource allocation, and risk management. It provides valuable insights into the cost and effort required for successful software development.

(b) Define terms: (i) NGT (ii) AON (iii) EV

ii). NGT: - NGT in project management stands for the "Nominal Group Technique." It is a structured brainstorming method used to gather input and generate ideas from a group of participants while ensuring equal participation and minimizing potential biases. NGT is particularly useful in project management for decision-making, problem-solving, and idea generation in a collaborative and structured manner. It encourages the active participation of all team members, prevents dominant voices from overshadowing others, and helps reach consensus on important project-related issues.

ii). AON = AON, which stands for "Activity-on-Node," is a network diagramming technique used in project management to represent and visualize the sequence of activities in a project. It is part of the broader family of network diagrams used for project planning and scheduling, with another common approach being the "Activityon-Arrow" (AOA) method. In AON, nodes (usually represented as circles or rectangles) represent project activities, and arrows connecting these nodes represent the logical dependencies or relationships between activities.

ii) EV: - Earned value (EV) is a way to measure and monitor the level of work completed on a project against the plan. Simply put, it's a quick way to tell if you're behind schedule or over budget on your project. You can calculate the EV of a project by multiplying the percentage complete by the total project budget.

Q.2 (a) List and explain content of Project Charter.

Ans.: A Project Charter is a formal document that authorizes the existence of a project, provides it with authority, and outlines its objectives, scope, roles, and responsibilities. Below is a simplified example of a Project Charter for the development of an eCommerce web application:

Project Charter: eCommerce Web Application Development
Project Title: eCommerce Web Application Development
Project Manager: [Your Name]
Project Sponsor: [Name of Sponsor]
Project Start Date: [Start Date]
Project End Date: [End Date]

1. Project Purpose and Justification: The purpose of this project is to design, develop, and launch a state-of-theart eCommerce web application that will enable our organization to expand its online presence, reach a wider
customer base, and increase sales. This project is essential to remain competitive in the digital marketplace and
meet evolving customer expectations.

2. Project Objectives:

- Develop a user-friendly and responsive eCommerce website.
- Create a secure and efficient payment processing system.
- Integrate inventory management and order fulfillment.
- Enhance the customer shopping experience.
- Increase online sales by [specific percentage or target].

3. Project Scope:
The project scope includes, but is not limited to:

- Website design and development.
- Integration of payment gateways.
- Inventory management system.
- User registration and authentication.
- Order processing and tracking.
- Customer support features.
- Security and compliance measures.

4. Stakeholders:

- Project Sponsor: [Name of Sponsor]
- Project Manager: [Your Name]

- Development Team: [List of team members]
- Marketing Team: [List of team members]
- Customer Support Team: [List of team members]
- Finance Team: [List of team members]
- Customers: [Identify key customer groups]
- Regulatory Bodies: [If applicable]

5. Project Timeline: The project is expected to start on [Start Date] and be completed by [End Date]. A detailed project schedule will
be developed and maintained to ensure the timely completion of project milestones

6. Project Budget: The estimated budget for this project is [Specify budget amount] to cover development, marketing, and
operational costs. A detailed budget breakdown will be provided in the project plan.

7. Risks and Mitigations: Identified risks include potential delays in development, security vulnerabilities, and changes in market
conditions. Mitigation plans will be developed to address these risks.

8. Project Authority: The undersigned stakeholders authorize the initiation of the eCommerce Web Application Development project
and commit to providing the necessary resources, support, and approvals to ensure its success.

Signatures:
[Name of Project Sponsor]
[Your Name, Project Manager]
Date: [Current Date]

(b) Explain project estimation terms: (i) Guesstimating (ii) Time boxing (iii) LOC

i) **Guesstimating: -** Guesstimating in project management refers to making educated or informed guesses about certain project-related factors when precise or detailed information is unavailable or when a quick estimate is needed. It is a common practice in the early stages of project planning and during project initiation when limited data is available. While it's not as accurate as detailed estimation techniques, guesstimating can help project managers and teams get a rough idea of key project parameters. Here are some situations where guesstimating may be used:

1. Preliminary Budgeting: In the early stages of a project, project managers may need to provide a ballpark figure for the project's budget. They can use their experience, historical data, or industry benchmarks to make a rough estimate until a more detailed budget can be prepared.

2. High-Level Scheduling: When initiating a project, it's often necessary to create a high-level project schedule before all the details are known. Guesstimating can be used to establish approximate start and end dates for project phases or milestones.

3. Resource Allocation: Project managers may need to allocate resources like personnel, equipment, or materials before detailed project plans are developed. Guesstimates can help determine resource needs temporarily.

4. Risk Assessment: In risk management, guesstimating can be used to identify potential risks and their impacts when precise data is lacking. It can help prioritize risks and guide further analysis.

5. Scope Definition: During the initial stages of a project, guesstimating can help in defining the project's scope and objectives before a comprehensive scope statement is developed.

ii) **Time Boxing: -** Timeboxing is a technique where you allocate a fixed amount of time for a specific project or task. This helps ensure that the project stays on schedule and that the team focuses on completing the work within the defined time frame. Time boxing is a way to manage time effectively and avoid project delays by setting clear time limits for various project activities or s. It encourages the team to work efficiently within those time constraints, fostering better project control and time management.

iii) **LOC: -** LOC is a count of the individual lines in a computer program's source code. Each line typically represents a single instruction or statement in the code. The number of lines of code in a software project can provide a rough idea of its size and, to some extent, its complexity. This metric is often used to estimate the effort, time, and resources required for software development, although it's important to note that LOC alone does not capture the quality, efficiency, or functionality of the software.

Q.3 (a) What is risk? Discuss various types of risks and risk identification techniques.

Ans.: Risk refers to the potential for an event or situation to hurt the objectives or outcomes of a project, organization, or individual. In the context of project management and business, risk can be anything that might hinder the achievement of goals, such as financial loss, delays, disruptions, safety concerns, or damage to reputation.

There are several types of risks, including:

1. Strategic Risks: These risks are associated with the overall strategic direction and decisions of an organization. They pertain to factors such as market changes, competitive forces, regulatory developments, and business model shifts.

2. Operational Risks: Operational risks arise from day-to-day activities and processes within an organization. They can include process failures, equipment breakdowns, supply chain disruptions, and human errors.

3. Financial Risks: Financial risks are related to the organization's financial health and stability. They encompass factors like market fluctuations, credit risks, liquidity issues, and currency exchange rate changes.

4. Compliance Risks: Compliance risks involve the potential for an organization to violate laws, regulations, or industry standards. Non-compliance can lead to legal penalties, fines, or damage to the organization's reputation.

5. Reputational Risks: Reputational risks are associated with events or actions that could harm an

organization's reputation or brand. This can include negative publicity, public relations crises, or social media backlash.

6. Market Risks: Market risks involve fluctuations in market conditions that can affect the organization's profitability. This includes factors like changes in demand, pricing, or consumer preferences.

7. Environmental Risks: These risks relate to environmental factors, such as natural disasters, climate change, and sustainability concerns, which can impact an organization's operations and reputation

Risk identification techniques are methods for identifying and categorizing potential risks. Here are some common risk identification techniques:

1. Brainstorming: Gather a group of experts or stakeholders to generate a list of potential risks through open discussion.

2. Checklists: Use predefined checklists or templates to identify common risks in specific industries or project types.

3. SWOT Analysis: Analyze an organization's strengths, weaknesses, opportunities, and threats to identify internal and external risks.

4. Expert Judgment: Seek input from subject matter experts, professionals, or experienced individuals who can identify risks based on their expertise.

5. Delphi Technique: Collect and refine expert opinions anonymously through multiple rounds of surveys to arrive at a consensus on risks.

6. Root Cause Analysis: Examine past issues or incidents to identify the root causes that led to those problems and understand potential risks.

7. Cause and Effect Diagrams (Fishbone Diagrams): Use diagrams to visualize the various causes that could lead to specific risks or problems.

8. Scenario Analysis: Create and analyses different scenarios to understand the potential risks associated with each scenario.

9. Risk Registers: Maintain a risk register or database to document and track identified risks along with their
attributes, including likelihood and impact.

10. External Sources: Monitor industry news, reports, and regulatory updates to identify external risks that
may impact the organization.

(b) Define statement of work (SOW), Scope statement and scope boundary. Give one example of each with respect to an eCommerce web application.

Ans: Statement of Work (SOW): A Statement of Work (SOW) is a document that defines the specific objectives, requirements, and deliverables of a project. It outlines the work to be performed, the project's scope, and the responsibilities of both the project team and the client or customer. It serves as a formal agreement between the parties involved in the project.

Example for an eCommerce Web Application SOW: For an eCommerce web application project, the SOW might include:

- Objective: Develop a fully functional eCommerce website that enables customers to browse products, add them to their cart, make online payments, and receive order confirmations.

- Requirements: The website should support user registration and login, product catalog management, secure payment processing, inventory tracking, order management, and customer support.

- Deliverables: The project will deliver a working website, user documentation, and training for the client's staff on content management.

- Responsibilities: The development team will design and build the website, while the client will provide product information and necessary marketing materials.

Scope Statement: A Scope Statement is a document that provides a detailed description of the project's objectives, deliverables, constraints, assumptions, and acceptance criteria. It serves as a reference point for all project stakeholders to understand what is included and excluded from the project scope.

Example for an eCommerce Web Application Scope Statement: For an eCommerce web application project, the Scope Statement might include:

- Project Objectives: To create a user-friendly eCommerce website that facilitates online shopping and provides a secure and efficient payment process.

- Deliverables: The project will produce a fully functional website with product listings, shopping cart functionality, secure payment processing, and order management features.

- Constraints: The project must operate within a budget of $X and a timeline of Y months.

- Assumptions: It is assumed that the client will provide product images and descriptions for the website.

- Acceptance Criteria: The website will be considered complete and accepted when it successfully processes test orders and meets performance and security standards.

Scope Boundary: The Scope Boundary, also known as the Scope Boundary Document, defines the limits of the project scope and identifies what is not included within the project. It helps prevent scope creep by clearly specifying what the project will not address.

Example for an eCommerce Web Application Scope Boundary: For an eCommerce web application project, the Scope Boundary might include:

- Exclusions: The project does not include the development of a mobile app, integration with external third-party systems, or marketing activities beyond initial on-site SEO.

- Constraints: The project will not address any hardware or infrastructure changes, such as server setup or hosting procurement.

- Interfaces: The project will not integrate with existing customer databases or legacy systems unless explicitly specified in a separate project phase.

Q.4 (a) What is project scheduling? Discuss steps for project scheduling development.

ANS: Ans.: Project scheduling is a fundamental aspect of project management. It involves the creation of a timeline or schedule that outlines when specific project tasks, activities, and milestones will be performed. Scheduling is crucial for effective project planning, execution, and monitoring to ensure that the project is completed on time and within budget. Project scheduling is an ongoing process that requires collaboration and adaptability. Effective scheduling helps manage resources efficiently, meet deadlines, and ensure the successful delivery of the project.

Here are the key steps for developing a project schedule:

1. Define Project Scope and Objectives:
    - Before scheduling, you must have a clear understanding of the project's scope and objectives. What needs to be accomplished? What are the project's deliverables and goals? This information forms the basis for scheduling.

2. Create a Work Breakdown Structure (WBS):
    - The WBS is a hierarchical breakdown of the project into smaller, manageable components. It divides the project into tasks, sub-tasks, and work packages. This helps you organize the project and ensures that nothing is overlooked.

3. Identify Task Dependencies:
    - Determine the relationships and dependencies between project tasks. Some tasks can only start once others are completed (finish-to-start), while others can run in parallel (start-to-start or finish-to-finish). Understanding dependencies is critical for sequencing tasks.

4. Estimate Task Durations:
    - Estimate the time required to complete each task. Task duration can be based on historical data, expert judgment, or other estimation techniques. It's essential to be realistic and consider various factors that may impact the duration.

5. Assign Resources:
    - Identify the resources (e.g., personnel, equipment, materials) needed for each task. Resource allocation ensures that you have the necessary people and tools available to complete the work on time.

6. Sequence Tasks:

- Arrange the tasks in the order they need to be completed, taking into account task dependencies and resource availability. This creates a logical flow for the project.

(b) What is stakeholder? How and What types of information is provided to stakeholder?

Ans.: Stakeholders are individuals, groups, or entities that have an interest or concern in a project or an organization's activities. They can be both internal and external to the project or organization and have varying levels of influence, interest, and impact on the project's outcomes. Stakeholder management is a critical aspect of project and organizational management, as it involves identifying, analyzing, and engaging with stakeholders to ensure their needs and expectations are met.

The information provided to stakeholders typically includes:

1. Project Progress: Stakeholders are interested in the overall progress of the project. They need to know whether the project is on track, behind schedule, or ahead of schedule. Information on completed tasks, work in progress, and upcoming activities is vital.

2. Budget and Costs: Stakeholders, especially those responsible for project funding, want to be informed about the project's financial status. This includes the budget, actual costs incurred, and any cost overruns or savings.

3. Scope Changes: Any changes to the project scope, such as additional features or alterations to requirements, need to be communicated to stakeholders. This information helps them understand the project's evolving scope.

4. Risks and Issues: Stakeholders should be aware of any risks that could impact the project's success. This includes not only the identification of risks but also the mitigation or contingency plans in place. Additionally, stakeholders need to know about any issues or problems that arise during the project and the actions taken to resolve them.

5. Quality and Deliverables: Information about the quality of project deliverables and their adherence to quality standards is essential. Stakeholders need to understand if the project is producing work that meets the expected quality levels.

6. Schedule and Timelines: Keeping stakeholders informed about the project's schedule, key milestones, and any changes to timelines is crucial. This helps manage expectations and ensure alignment with the project's timeline.

7. Stakeholder Feedback: Gathering and sharing feedback from stakeholders is essential. It provides insight
into their concerns, needs, and expectations, allowing for adjustments to the project as necessary.

8. Communication Plan: Stakeholders need to be aware of the project's communication plan, including how
and when they will receive updates and reports.

9. Decisions and Recommendations: Informing stakeholders about key decisions made during the project

and the rationale behind them is important. They should also receive recommendations from project teams or experts when needed.

10. Resource Allocation: Information on the allocation and utilization of resources, including personnel, materials, and equipment, is crucial for stakeholders, particularly for resource planning and budgeting.

11. Regulatory and Compliance Updates: If the project is subject to regulatory requirements or compliance standards, stakeholders need updates on the project's adherence to these standards.

12. Environmental and Social Impact: In some projects, stakeholders are concerned about the environmental and social impact. Information related to sustainability, social responsibility, and environmental considerations may need to be provided.

Or

Q.4 (a) Write Short Note: individual performance review, postmortem review

(b) What is verification and validation? Which activities support validation and verification?

ANS: Verification - Verification is the process of evaluating and confirming that a product, system, or component is being built or developed correctly according to its design, specifications, and predefined requirements. Verification activities can include reviews, inspections, testing, and other methods to validate that the work is consistent with the planned requirements and design at various stages of development.

Validation - Validation is the process of determining whether a product, system, or component, as a whole, meets the user's needs and requirements and functions as intended in its real-world context. It focuses on confirming that the final product or system satisfies the customer's or user's intended use and provides the desired functionality. Validation typically involves testing the complete product or system to ensure that it aligns with user expectations and effectively serves its intended purpose.

Here are some activities that support validation and verification:

1. **Reviews and Inspections:** Regular reviews and inspections of project documentation, code, and other artifacts help identify errors, inconsistencies, and compliance with design and requirements, contributing to both verification and validation.

2. **Testing**: Testing is a fundamental activity for both verification and validation. Verification testing ensures that each component or phase of the project meets its design and requirements. Validation testing evaluates the complete product or system to ensure it meets user needs.

3. **Documentation and Documentation Review**: Well-documented design and requirements specifications support verification by providing a basis for checking that the project adheres to its plans. Documentation review ensures that documents are complete and accurate.

4. **User Acceptance Testing (UAT):** UAT is a critical activity for validation. End-users or stakeholders test the product to ensure it meets their requirements and expectations.

5. **Prototyping**: Prototyping can be used to validate a design concept with users before the full product development, providing valuable feedback for validation.

6**. Risk Management**: Risk identification and analysis activities are crucial for both verification (addressing potential risks in the development process) and validation (anticipating risks that may affect the product's performance).

7. **Configuration Management:** Configuration management processes support verification by ensuring that project components and documentation are well-controlled and consistent.

12. **Continuous Improvement:** Activities related to collecting feedback, documenting lessons learned, and implementing process improvements support ongoing verification and validation enhancements.

10. **Peer Reviews**: Peer reviews involve colleagues or team members examining each other's work to identify defects, inconsistencies, and issues, supporting both verification and validation.

Q.5 (a) Discuss content of communication plan.

ANS: A Communication Plan is a crucial component of project management, outlining how information is shared, who is responsible for communication, and the methods used to keep stakeholders informed. The content of a communication plan typically includes the following elements:

1. Project Overview:
    - A brief description of the project, its objectives, scope, and importance.

2. Purpose and Objectives of Communication:
    - Clearly define the purpose of the communication plan, which is typically to ensure stakeholders are well-informed and aligned with the project's goals.

3. Stakeholder Analysis:
    - Identify all project stakeholders, both internal and external. Categorize them based on their level of influence, interest, and specific communication needs.

4. Key Messages:
    - Determine the main messages that need to be conveyed to stakeholders. These messages should align with the project's objectives and address stakeholder concerns.

6. Frequency and Timing:
    - Determine how often communications will occur and the timing of major updates or milestones. For example, weekly status reports or monthly stakeholder meetings.

7. Sender and Receiver:
    - Clearly identify who will send the messages and who will receive them. This should include the responsible parties for each type of communication.

8. Escalation Procedures:
    - Define a process for handling issues or concerns that may arise during the project. Describe how these will be escalated and resolved.

9. Roles and Responsibilities:

- Clearly outline the roles and responsibilities of the project team members and other stakeholders in terms of communication. Who is responsible for what?

10. Risk and Issue Communication:
- Detail how risks and issues will be communicated and managed throughout the project. This should include the process for reporting and addressing problems.

11. Feedback Mechanism:
- Establish a mechanism for stakeholders to provide feedback, ask questions, or voice concerns. This may include surveys, suggestion boxes, or regular feedback meetings.

13. Approval and Sign-off:
- Specify how the communication plan will be approved and signed off by key stakeholders or project sponsors.

14. Review and Update Process:
- Include a process for reviewing and updating the communication plan as the project progresses. This ensures that the plan remains effective and relevant.

(b) What is the importance of a project closure? What is the purpose of project audit?

ANS: Importance of Project Closure:

1. Formalizing Completion: Project closure is the formal recognition that a project has been completed. It marks the endpoint of project activities, ensuring that all project work has been finished, objectives met, and deliverables produced.

2. **Resource Release:** Closure helps release project resources, both human and financial. Team members can be reassigned to other projects, and funds can be reallocated.

3. **Client Acceptance:** It allows for formal acceptance of the project's deliverables by the client or stakeholders, ensuring that they are satisfied with the results.

4. **Documentation**: Project closure involves documenting the project's outcomes, lessons learned, and final reports. This documentation serves as a reference for future projects and provides a historical record.

5. **Risk Mitigation:** It ensures that outstanding issues, risks, and open items are addressed, reducing the chance of post-project problems or disputes.

6. **Learning and Improvement**: The closure process encourages a review of the project's successes and challenges, facilitating organizational learning and process improvement.

7. **Financial Closure:** It helps finalize financial accounts, closing project budgets, and accounting for all project costs.

8. **Stakeholder Communication:** Closure involves notifying stakeholders of project completion, acknowledging their support, and sharing the outcomes.

Purpose of Project Audit:

A project audit is a review and assessment of a project's processes, performance, and outcomes. Its primary purposes are:

1**. Quality Assurance:** To assess whether the project adhered to quality standards, best practices, and compliance requirements. It helps ensure that the project was executed with the desired level of quality.

2. **Performance Evaluation**: To evaluate how well the project performed in terms of meeting its objectives, schedule, and budget. A project audit can identify areas of overruns or deviations.

3**. Risk Assessment:** To examine the project's risk management strategies and assess their effectiveness. It identifies any risks that were inadequately addressed during the project.

4. **Lessons Learned:** To capture lessons learned from the project, including both successes and challenges. This information is valuable for future projects and organizational improvement.

5. **Compliance Check**: To verify that the project adhered to legal, regulatory, and contractual requirements. It helps identify any non-compliance issues that need to be addressed.

6. **Documentation Review**: To ensure that project documentation is complete, accurate, and wellorganized. It also assesses the quality of project records.

7. **Resource Utilization:** To evaluate how project resources, including personnel and finances, were managed and utilized during the project.

8. **Stakeholder Feedback:** To gather feedback from project stakeholders, including the client, team members, and others, to assess their satisfaction and identify areas for improvement.

9**. Closure Verification:** To confirm that all project closure activities were completed satisfactorily and that the project is ready to be officially closed.

10. **Decision Support:** The findings and recommendations from a project audit can inform decisions about future projects, resource allocation, and process improvements within the organization.