| a. Brief Answer Questions: 2023 | a. 2022 AI TU |
|---|---|
| 2. How does deterministic environment differ from stochastic environment? | 11. Why do we need to make the machine learn? |
| 3. What is constraint satisfaction problem? | 12. What is rational agent? |
| 4. Give an example of skolemization. | 13. Give an example of CNF expression. |
| 5. List the problem of depth limited search. | 14. What are the four ways to evaluate the performance of searching? |
| 6. What is the limitation of sigmoid activation function? Write any two conflict resolution strategy in production system. | 15. Why do we need to analyze semantics over syntactic? |
| 7. Numerically illustrate fuzzy union operation | 16. What is the function of inference engine in expert system? |
| 8. How does utility based agent differ with goal based agent? | 17. Why we need probabilistic reasoning in AI? |
| 9. Write the heuristic function for A* search. | 18. List out any two activation functions. |
| 10. What are the types of crossover in genetic algorithm? | 19. Why do we need to address fuzzy logic in AI? |
| | 20. What do you mean by reinforcement learning? |
| a. Make 2020 | a. 2019 |
| 21. What are the requirements to pass the Turing Test? | 31. Define Omniscience. |
| 22. What is agent function? | 32. Define sequential environment. |
| 23. Convert given statement into predicate logic "Every teacher is liked by some student". | 33. Write Modus Ponen Rule. |
| 24. Define triggering in production system. | 34. In NLP, why semantic analysis is used? |
| 25. Compare fuzzy logic with binary logic. | 35. What does a Production Rule Consist Of? |
| 26. What do you mean by machine learning? | 36. Define fuzzy set and crisp set. |
| 27. Differentiate between universal and existential quantifiers. | 37. Compare expert system and human expert. |
| 28. Define plateau problem. | 38. Define disjunctive normal form. |
| 29. Why natural language processing is a difficult task? | 39. Write any one importance of artificial intelligence. |
| 30. Define knowledge engineering in expert system. | 40. What do you mean by fringe nodes? |
| a. 2018 | a. 2017 |
| 41. What is learning agent? | 51. When machine is termed intelligent in Turing Test? |
| 42. What is alpha beta pruning? | 52. Define agent function. |
| 43. Define inference engine. | 53. Why pragmatic analysis is necessary in NLP? |
| 44. List the components of problem definition. | 54. In what type of situation fuzzy logic can be used? |
| 45. What is meant by logical consequence? | 55. "Every husband loves his wife", convert the above statement in FOPL. |
| 46. In which situation fuzzy logic can be used? | 56. What is unsupervised learning? |
| 47. What is meant by expert system shell? | 57. Write any two conflict resolution strategies in production system. |
| 48. With suitable example write on crossover operator in genetic algorithm. | 58. What is skolemization? |
| 49. What is pragmatic analysis? | 59. What do you mean by Admissible heuristics? |
| 50. What is DENDRAL? | 60. What is alpha-beta purning? |
| 2015 | 2015 |
| 61. What is Artificial Intelligence? | 67. Define conjunctive normal form with suitable example. |
| 62. Define omniscience. | 68. Define mutation in genetic algorithm. |
| 63. How is performance of search algorithm measured? | 69. Define rule based expert system. |
| 64. What is cryptarithmetic? | 70. What is meant by machine translation in NLP? |
| 65. What is the limitation of propositional logic over predicate logic? | |
| 66. State Modus Ponens inference rule with suitable example. | |

Brief answers questions:
2023

2. Deterministic vs. Stochastic Environment:
   - Deterministic Environment: The outcome of every action is predictable and certain.
   - Stochastic Environment: The outcome of actions involves some level of randomness or uncertainty.

3. Constraint Satisfaction Problem (CSP):
   - A problem where the goal is to find values for variables that satisfy a set of constraints.

4. Example of Skolemization:
   - Original statement: "Every student is taught by a teacher."
   - Skolemized form: "For every student $(x)$, there exists a specific teacher $(t_x)$ such that $(x)$ is taught by $(t_x)$."

5. Problems of Depth-Limited Search:
   - Incompleteness: It may not find a solution if it is deeper than the depth limit.
   - Inconsistency: Solutions may be found that are not the best because it does not explore all possibilities.

6. Limitation of Sigmoid Activation Function:
   - Vanishing Gradient Problem: Gradients become very small, causing slow convergence during training.
   - Conflict Resolution Strategies in Production Systems:
     - Specificity: Prefer rules with more specific conditions.
     - Recency: Prefer rules that have been recently used.

7. Fuzzy Union Operation:
   - For fuzzy sets $(A)$ and $(B)$ with membership values $( \mu_A(x) )$ and $( \mu_B(x) )$ respectively, the fuzzy union is defined as $( \mu_{A \cup B}(x) = \max(\mu_A(x), \mu_B(x)) )$.

8. Utility-Based vs. Goal-Based Agent:
   - Utility-Based Agent: Chooses actions based on a utility function to maximize overall satisfaction.
   - Goal-Based Agent: Chooses actions to achieve specific goals, without considering the overall satisfaction.

9. Heuristic Function for A* Search:
   - The heuristic function $(h(n))$ estimates the cost from node $(n)$ to the goal. The total cost function used is $(f(n) = g(n) + h(n))$, where $(g(n))$ is the cost to reach node $(n)$ from the start.

10. Types of Crossover in Genetic Algorithms:
    - Single-Point Crossover: A crossover point is chosen randomly, and segments are swapped.
    - Two-Point Crossover: Two crossover points are chosen, and segments between them are swapped.

2022

11. Need for Machine Learning:
    - To enable systems to improve performance and make decisions based on data and experience without being explicitly programmed.

12. Rational Agent:
    - An agent that acts to maximize its expected performance measure based on its knowledge and goals.

13. Example of CNF Expression:
    - $((A \lor B) \land (\neg A \lor C))$

**14. Four Ways to Evaluate Search Performance:**
   - **Completeness: Whether the algorithm finds a solution if one exists.**
   - **Optimality: Whether the solution found is the best.**
   - **Time Complexity: How the running time grows with problem size.**
   - **Space Complexity: How memory usage grows with problem size.**

**15. Analyzing Semantics Over Syntactics:**
   - **Semantics deals with meaning, which is crucial for understanding context and ensuring correct interpretation, while syntax is just about structure.**

**16. Function of Inference Engine in Expert Systems:**
   - **To apply logical rules to the knowledge base to derive new information or make decisions.**

**17. Need for Probabilistic Reasoning in AI:**
   - **To handle uncertainty and make decisions when there is incomplete or uncertain information.**

**18. Two Activation Functions:**
   - **Sigmoid: $\sigma(x) = \frac{1}{1 + e^{-x}}$**
   - **ReLU (Rectified Linear Unit): $\text{ReLU}(x) = \max(0, x)$**

**19. Addressing Fuzzy Logic in AI:**
   - **To handle imprecise or ambiguous information and make decisions in complex or uncertain environments.**

**20. Reinforcement Learning:**
   - **A type of machine learning where an agent learns to make decisions by receiving rewards or penalties for actions in an environment.**

**2020**

**21. Requirements to Pass the Turing Test:**
   - **The machine must exhibit intelligent behavior indistinguishable from that of a human during a conversation.**

**22. Agent Function:**
   - **Defines the behavior of an agent, mapping from percepts to actions.**

**23. Convert to Predicate Logic:**
   - $(\forall x \text{ (Teacher(x)} \rightarrow \exists y \text{ (Student(y)} \land \text{Likes(y, x))}))$

**24. Triggering in Production Systems:**
   - **The process of determining when the conditions of a rule are satisfied so that the rule can be applied.**

**25. Fuzzy Logic vs. Binary Logic:**
   - **Fuzzy Logic: Deals with degrees of truth and partial membership.**
   - **Binary Logic: Uses strict true/false values.**

**26. Machine Learning:**
   - **A field of AI focused on developing algorithms that allow computers to learn from and make predictions or decisions based on data.**

**27. Universal vs. Existential Quantifiers:**
   - **Universal Quantifier (∀): Indicates that a statement is true for all elements in a domain.**
   - **Existential Quantifier (∃): Indicates that there is at least one element in a domain for which the statement is true.**

**28. Plateau Problem:**
   - **Occurs when the search algorithm encounters a flat local maximum and gets stuck, unable to proceed.**

**29. Difficulty in Natural Language Processing:**
   - **Due to ambiguity, context sensitivity, and the vast variability of human language.**

**30. Knowledge Engineering in Expert Systems:**
   - **The process of developing and maintaining the knowledge base and inference rules of an expert system.**

**2019**

**31. Omniscience:**
   - **The property of knowing everything, often used to describe an idealized agent with complete knowledge of the environment.**

**32. Sequential Environment:**
   - **An environment where the agent's actions have a clear sequence and future states depend on the current state and action.**

**33. Modus Ponens Rule:**
   - **If $P$ implies $Q$ and $P$ is true, then $Q$ must also be true.**

**34. Semantic Analysis in NLP:**
   - **To understand the meaning and context of words and sentences to improve the accuracy of language processing.**

**35. Production Rule Consists Of:**
   - **Condition (if part) and Action (then part) that determine the rule's applicability and resultant action.**

**36. Fuzzy Set vs. Crisp Set:**
   - **Fuzzy Set: Membership is gradual and can have values between 0 and 1.**
   - **Crisp Set: Membership is binary, either 0 or 1.**

**37. Expert System vs. Human Expert:**
   - **Expert System: Uses predefined rules and knowledge to provide expertise.**
   - **Human Expert: Applies intuition, experience, and contextual understanding.**

**38. Disjunctive Normal Form (DNF):**
   - **A logical formula in which the expression is a disjunction of conjunctions (e.g., $(A \land B) \lor (\neg C \land D)$).**

**39. Importance of Artificial Intelligence:**
   - **To automate tasks, enhance decision-making, and solve complex problems that are difficult or impractical for humans.**

**40. Fringe Nodes:**
   - **Nodes that have been generated but not yet expanded in a search algorithm.**

**2018**

**41. Learning Agent:**
   - **An agent that improves its performance over time by learning from its experiences.**

**42. Alpha-Beta Pruning:**
   - An optimization technique for the minimax algorithm to reduce the number of nodes evaluated in the search tree.

**43. Inference Engine:**
   - The component of an expert system that applies logical rules to the knowledge base to derive new information.

**44. Components of Problem Definition:**
   - Initial State: Starting point.
   - Actions: Possible moves or operations.
   - Goal State: Desired outcome.
   - Path Cost: Cost associated with actions.

**45. Logical Consequence:**
   - A statement that must be true if the premises are true.

**46. Situation for Using Fuzzy Logic:**
   - When dealing with uncertain, imprecise, or qualitative information.

**47. Expert System Shell:**
   - A software framework that provides the basic components for developing an expert system without specifying the knowledge base.

**48. Crossover Operator in Genetic Algorithm:**
   - Example: In single-point crossover, a random point is selected in two parent chromosomes, and segments are exchanged to create offspring.

**49. Pragmatic Analysis:**
   - The study of how context influences the interpretation of language, including speaker intentions and social aspects.

**50. DENDRAL:**
   - An early expert system used for chemical analysis, specifically for identifying molecular structures from mass spectrometry data.

**2017**

**51. Machine Intelligence in Turing Test:**
   - When a machine's responses are indistinguishable from those of a human in a conversation.

**52. Agent Function:**
   - A function that maps percepts to actions, defining the agent's behavior.

**53. Necessity of Pragmatic Analysis:**
   - To

 understand the intended meaning behind language use, including context, tone, and implied meanings.

**54. Situation for Using Fuzzy Logic:**
   - When precise information is unavailable and decision-making requires handling of partial truths.

**55. FOPL Conversion:**
   - $\forall x \text{ (Husband(x) → Loves(x, Wife(x)))}$

**56. Unsupervised Learning:**
   - A type of machine learning where the model learns patterns and structures from unlabeled data.

**57. Conflict Resolution Strategies:**
   - Priority: Resolve conflicts based on predefined priorities.
   - Random Selection: Choose rules randomly when conflicts occur.

**58. Skolemization:**
   - The process of removing existential quantifiers by introducing Skolem functions or constants.

**59. Admissible Heuristics:**
   - Heuristics that do not overestimate the cost to reach the goal, ensuring optimality in search algorithms.

**60. Alpha-Beta Pruning:**
   - An optimization technique for the minimax algorithm to eliminate branches that cannot affect the final decision.

**2015**

**1. Artificial Intelligence (AI):**
   - AI is the field of computer science focused on creating systems that can perform tasks requiring human intelligence, such as learning, reasoning, problem-solving, and understanding natural language.

**2. Omniscience:**
   - Omniscience refers to the property of having complete and unlimited knowledge about all aspects of a domain or environment.

**3. Performance of Search Algorithm:**
   - Time Complexity: The amount of time it takes to find a solution.
   - Space Complexity: The amount of memory required.
   - Completeness: Whether it finds a solution if one exists.
   - Optimality: Whether it finds the best solution.

**4. Cryptarithmetic:**
   - A type of mathematical puzzle where letters stand for digits in arithmetic equations, and the goal is to find the digit corresponding to each letter to satisfy the equation.

**5. Limitation of Propositional Logic over Predicate Logic:**
   - Lack of Expressiveness: Propositional logic cannot express statements about objects and their relationships, unlike predicate logic which can handle quantifiers and more complex statements.

**6. Modus Ponens Inference Rule:**
   - Rule: If $P \rightarrow Q$ (if $P$ then $Q$) and $P$ is true, then $Q$ must also be true.
   - Example: If it is raining (P), then the ground will be wet (Q). It is raining (P). Therefore, the ground will be wet (Q).

**7. Conjunctive Normal Form (CNF):**
   - A logical formula is in CNF if it is a conjunction of one or more disjunctions of literals.
   - Example: $(A \lor B) \land (\neg A \lor C)$

**8. Mutation in Genetic Algorithm:**
   - Mutation is an operation that introduces random changes to an individual's genetic code (chromosome) to maintain genetic diversity within the population and prevent premature convergence.

**9. Rule-Based Expert System:**
   - A system that uses a set of "if-then" rules to make decisions or infer new information from a knowledge base. It applies these rules based on given conditions to derive conclusions or actions.

**10. Machine Translation in NLP:**
   - Machine Translation (MT) is the automatic process of translating text or speech from one language to another using computational algorithms and models.

### 2015 MIS
1) List the tasks of system analyst.
2) What is business process re-engineering?
3) Define agency cost theory.
4) Differentiate between virus and worm.
5) Define Information System.
6) What is computer forensics?
7) Define information asymmetry.
8) Define Electronic Data Interchange.
9) Why employee are said to be internal threats?
10) What is enterprise resource planning?

### 2016 MIS
11) Define management information system.
12) Why is copyright created?
13) Write one of the tasks performed in human resource unit of organization.
14) What is portfolio analysis?
15) List any two unique features of an organization.
16) What is role of a chief information office?
17) Define information asymmetry.
18) What is network economics?
19) What do you mean by accountability?
20) List any two electronic payment methods.

### 2017
21) Define an information system.
22) What do you mean by customer centered business?
23) Define OLAP.
24) Define distributed database.
25) Define sales force automation.
26) List three features of quality information.
27) Define goal-seeking analysis.
28) In which level of management TPS is used?
29) Define e-commerce.
30) What do you mean by bargaining power of customer?

### 2018
31) What are the major information system activities?
32) How information system helps to raise the barriers to entry?
33) Differentiate between data and information.
34) What are the major functions of DBMS?
35) Why knowledge management is important?
36) What is supply chain management?
37) What types of reporting are supported by MIS?
38) What is drill up operation?
39) What is extranet?
40) Why MIS fails?

### 2019
41) Define an information system.
42) How company can become Agile?
43) Write any one advantage of a virtual company.
44) Define knowledge management system. v
45) What do you mean by what-if analysis?
46) List OLAP activities.
47) List attributes of quality information.
48) Name different components of targeted marketing.
49) What do you mean by the threat of substitutes?
50) Define database interrogation.

### 2020 make up
51) Is information system and information technology same?
52) Why is customer Relation Management important for business?
53) List different people resources of IS.
54) Who uses TPS and DSS?
55) Define BPR.
56) What do you mean by cost leadership strategy?
57) Define OLAP.
58) What is sensitivity analysis?
59) Define data mining.
60) Differentiate between hypermedia database and external database.

### 2022
61) Differentiate between e-business and e-commerce.
62) List out different components of an information system.
63) List out the competitive forces for achieving competitive advantage.
64) What do you mean by business process reengineering?
65) Define virtual company.
66) Why data in data warehouse are non volatile and subject oriented?
67) List out any two characteristics of transaction processing system?
68) What do you mean by interactive marketing?
69) How sales automation helps to gain a strategic advantages in sales productivity and
70) marketing responsiveness.
71) Differentiate between unstructured, semi structured and structured decision making.

### 2023
72) Define e-business.

73) List out the components of.IS.
74) What is the purpose of value chain model?
75) Define sale force automation.
76) What is the advantage of virtual company?
77) What are the uses of data mining?
78) List out any four characteristics of transaction process system (TPS).
79) Define goal-seeking analysis.
80) List out the types of information system on the basis of organization structure.
81) What do you mean by low cost leadership strategy?

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Here are brief answers to the questions:
**2015 MIS**

**1. Tasks of a System Analyst:**
  - Requirements gathering and analysis
  - System design and specification
  - System implementation and testing
  - User training and support
  - Documentation and maintenance

**2. Business Process Re-engineering (BPR):**
  - A management strategy focusing on redesigning business processes to achieve significant improvements in performance, such as cost reduction and quality enhancement.

**3. Agency Cost Theory:**
  - A concept in financial management that refers to the costs arising from conflicts of interest between the principal (owner) and the agent (manager) in a firm.

**4. Virus vs. Worm:**
  - Virus: A malicious program that attaches itself to a legitimate file or program and spreads to other files or systems.
  - Worm: A standalone malicious program that replicates itself to spread across networks without needing to attach to files.

**5. Information System:**
  - A combination of hardware, software, data, people, and procedures that work together to produce information for decision-making.

**6. Computer Forensics:**
  - The process of collecting, analyzing, and preserving digital evidence from computers and electronic devices to investigate and solve cybercrimes.

**7. Information Asymmetry:**
  - A situation where one party has more or better information compared to another, often leading to imbalances in transactions or decisions.

**8. Electronic Data Interchange (EDI):**
  - The electronic exchange of business documents between organizations in a standardized format.

**9. Internal Threats:**
  - Employees are considered internal threats due to their access to sensitive information and systems, which can be misused intentionally or unintentionally.

**10. Enterprise Resource Planning (ERP):**
  - Integrated software systems that manage and automate core business processes across various departments, such as finance, HR, and supply chain.

**2016 MIS**

**11. Management Information System (MIS):**
  - A system that provides managers with tools to organize, evaluate, and manage departments efficiently.

**12. Copyright Creation:**
  - To protect the intellectual property rights of creators by giving them exclusive rights to reproduce, distribute, and perform their works.

**13. Human Resource Task:**
  - Recruiting and hiring employees, managing payroll, and administering benefits.

**14. Portfolio Analysis:**
  - The process of evaluating and managing a collection of investments or projects to optimize performance and align with strategic goals.

**15. Unique Features of an Organization:**
  - Organizational culture and structure
  - Strategic objectives and goals

**16. Role of a Chief Information Officer (CIO):**
  - Oversee and manage the organization's IT strategy, systems, and infrastructure to support business goals.

**17. Information Asymmetry: (Same as 7 above)**

**18. Network Economics:**
  - The study of how the value of goods or services increases as the number of users in a network grows.

**19. Accountability:**
  - The obligation of individuals or organizations to account for their activities and accept responsibility for them.

**20. Electronic Payment Methods:**
  - Credit/debit cards
  - Online payment systems (e.g., PayPal)

**2017 MIS**

**21. Information System: (Same as 5 above)**

**22. Customer-Centered Business:**
  - A business approach focused on understanding and meeting the needs and preferences of customers to enhance satisfaction and loyalty.

**23. OLAP (Online Analytical Processing):**
  - A category of software technology that enables analysts to perform complex queries and data analysis quickly.

**24. Distributed Database:**
  - A database that is spread across multiple physical locations but appears as a single database to users.

**25. Sales Force Automation (SFA):**

- Technology designed to streamline and automate sales processes, such as tracking customer interactions and managing sales leads.

**26. Features of Quality Information:**
- Accuracy
- Timeliness
- Relevance

**27. Goal-Seeking Analysis:**
- A type of analysis used to determine the necessary inputs or conditions needed to achieve a desired outcome.

**28. TPS Level:**
- Transaction Processing Systems (TPS) are typically used at the operational level of management.

**29. E-Commerce:**
- The buying and selling of goods or services over the internet.

**30. Bargaining Power of Customers:**
- The ability of customers to influence prices and terms in their favor due to their negotiating power or alternatives.

**2018 MIS**

**31. Major Information System Activities:**
- Data collection
- Data processing
- Information distribution
- Decision support

**32. Information Systems and Barriers to Entry:**
- Information systems can create barriers to entry by increasing operational efficiency, creating competitive advantages, and enhancing customer loyalty.

**33. Data vs. Information:**
- Data: Raw, unprocessed facts and figures.
- Information: Processed and organized data that is meaningful and useful for decision-making.

**34. Major Functions of DBMS (Database Management System):**
- Data storage and retrieval
- Data security and integrity
- Data manipulation and querying

**35. Knowledge Management Importance:**
- Helps organizations capture, share, and utilize knowledge to improve decision-making, innovation, and efficiency.

**36. Supply Chain Management (SCM):**
- The management of the flow of goods, information, and finances from suppliers to customers to optimize overall supply chain performance.

**37. MIS Reporting Types:**
- Routine reports
- Ad-hoc reports
- Exception reports

**38. Drill-Up Operation:**
- An OLAP operation that summarizes data by aggregating it to a higher level of granularity.

**39. Extranet:**
- A private network that allows authorized external users to access certain parts of an organization's information systems.

**40. Why MIS Fails:**
- Poor planning and implementation
- Lack of user involvement and training
- Inadequate system support

**2019 MIS**

**41. Information System: (Same as 5 above)**

**42. Becoming Agile:**
- Companies can become agile by adopting flexible methodologies, fostering a culture of continuous improvement, and quickly adapting to changes.

**43. Advantage of a Virtual Company:**
- Reduced overhead costs and increased flexibility in operations.

**44. Knowledge Management System (KMS):**
- A system designed to facilitate the collection, sharing, and management of organizational knowledge and information.

**45. What-If Analysis:**
- A technique used to evaluate the impact of different scenarios or variables on outcomes and decision-making.

**46. OLAP Activities:**
- Data querying
- Data drilling
- Data slicing and dicing

**47. Attributes of Quality Information:**
- Accuracy
- Timeliness
- Completeness
- Relevance

**48. Components of Targeted Marketing:**
- Market segmentation
- Customer profiling
- Personalized messaging

**49. Threat of Substitutes:**
- The risk that alternative products or services can replace or reduce demand for a company's offerings.

**50. Database Interrogation:**
- The process of querying and extracting information from a database to generate reports or analyze data.

**2020 Make-Up**

**51. Information System vs. Information Technology:**
  - Information System: A system that integrates technology, people, and processes to manage and analyze information.
  - Information Technology: The hardware and software used to manage and process information.

**52. Importance of CRM:**
  - Enhances customer relationships, improves customer service, and increases customer retention and satisfaction.

**53. People Resources of IS:**
  - System analysts
  - Database administrators
  - IT managers

**54. TPS and DSS Users:**
  - TPS (Transaction Processing System): Operational staff and managers.
  - DSS (Decision Support System): Middle and senior management.

**55. Business Process Reengineering (BPR): (Same as 2 above)**

**56. Cost Leadership Strategy:**
  - A strategy where a company aims to become the lowest-cost producer in its industry to gain a competitive advantage.

**57. OLAP: (Same as 23 above)**

**58. Sensitivity Analysis:**
  - The study of how the variability in output of a model can be attributed to different sources of variability in the input.

**59. Data Mining:**
  - The process of discovering patterns, correlations, and useful information from large datasets using statistical and computational techniques.

**60. Hypermedia Database vs. External Database:**
  - Hypermedia Database: Stores interconnected multimedia content.
  - External Database: A database that is accessed from outside the organization or system.

**2022 MIS**

**61. E-Business vs. E-Commerce:**
  - E-Business: Broader concept encompassing all business processes conducted online, including e-commerce.
  - E-Commerce: Specific aspect of e-business focused on online buying and selling of goods and services.

**62. Components of an Information System: (Same as 5 above)**

**63. Competitive Forces for Achieving Competitive Advantage:**
  - Threat of new entrants
  - Bargaining power of suppliers
  - Bargaining power of customers
  - Threat of substitutes
  - Industry rivalry

**64. Business Process Reengineering (BPR): (Same as 2 above)**

**65. Virtual Company:**
  - An organization that uses digital communication and virtual collaboration to operate without a physical office or centralized location.

**66. Non-Volatile and Subject-Oriented Data in Data Warehouse:**
  - Non-volatile: Data is not frequently updated or deleted.

**2022 MIS**

**66. Non-Volatile and Subject-Oriented Data in Data Warehouse:**
  - Non-Volatile: Data is not frequently changed or updated after being loaded into the data warehouse. This ensures consistency and stability for analysis.
  - Subject-Oriented: Data is organized around key subjects (e.g., sales, customers) rather than being application-specific, facilitating comprehensive analysis and reporting on different aspects of the business.

**67. Characteristics of Transaction Processing System (TPS):**
  - Real-Time Processing: Handles transactions instantly to ensure up-to-date information.
  - High Volume: Manages large amounts of transactions and data efficiently.

**68. Interactive Marketing:**
  - A marketing strategy that involves direct engagement with customers through various channels (e.g., social media, email) to create personalized and interactive experiences.

**69. Sales Automation for Strategic Advantage:**
  - Sales Productivity: Automates repetitive tasks such as lead tracking and follow-ups, allowing sales teams to focus on high-value activities.
  - Marketing Responsiveness: Provides real-time insights and analytics, enabling quicker adjustments to marketing strategies and improving customer engagement.

**70. Marketing Responsiveness (continued):**
  - Data-Driven Decisions: Enables data-driven decisions by providing detailed analytics and performance metrics.
  - Efficient Resource Allocation: Helps in allocating resources more effectively based on sales performance and market trends.

**71. Decision-Making Types:**
  - Unstructured Decision-Making: Involves decisions with no predefined procedure or solution, often relying on intuition and judgment (e.g., strategic planning).
  - Semi-Structured Decision-Making: Involves a mix of structured and unstructured elements, often guided by existing procedures but requiring some judgment (e.g., budget allocation).
  - Structured Decision-Making: Involves decisions that follow a defined process with clear rules and procedures (e.g., payroll processing).

**2023**

**72. E-Business:**
  - The conduct of business processes over the internet, encompassing a wide range of activities such as e-commerce, online transactions, and digital communications.

**73. Components of an Information System:**
  - Hardware: Physical devices and equipment.
  - Software: Applications and operating systems.
  - Data: Information used by the system.
  - People: Users and IT professionals.
  - Procedures: Rules and guidelines for using the system.

**74. Purpose of Value Chain Model:**
   - To analyze and optimize each stage of a company's operations to create value and gain a competitive advantage by enhancing efficiency and effectiveness.

**75. Sales Force Automation (SFA):**
   - A technology solution that automates sales tasks such as lead management, contact tracking, and sales reporting to improve sales efficiency and effectiveness.

**76. Advantage of Virtual Company:**
   - Reduced Overhead Costs: Lower operational expenses due to the absence of physical office space and related costs.

**77. Uses of Data Mining:**
   - Customer Insights: Identifying patterns and trends in customer behavior.
   - Fraud Detection: Detecting unusual patterns that may indicate fraudulent activities.
   - Market Analysis: Understanding market trends and consumer preferences.
   - Risk Management: Assessing and mitigating risks based on data patterns.

**78. Characteristics of Transaction Processing System (TPS):**
   - Accuracy: Ensures precise and reliable transaction data.
   - Efficiency: Processes large volumes of transactions quickly and accurately.
   - Consistency: Maintains data consistency across the system.
   - Security: Protects transaction data from unauthorized access and alterations.

**79. Goal-Seeking Analysis:**
   - A technique used to determine the required inputs or conditions needed to achieve a specific desired outcome.

**80. Types of Information Systems Based on Organization Structure:**
   - Operational Systems: Support day-to-day operations (e.g., TPS).
   - Management Systems: Aid in managing and controlling operations (e.g., MIS).
   - Decision Support Systems: Assist in decision-making with data analysis (e.g., DSS).
   - Executive Information Systems: Provide high-level summaries and insights for executives (e.g., EIS).

**81. Low-Cost Leadership Strategy:**
   - A competitive strategy where a company aims to become the lowest-cost producer in its industry, thereby attracting price-sensitive customers and achieving a competitive edge.

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**OOAD(Object Oriented Analysis and Design)**

| 2017 | 2018 |
|---|---|
| 1.  What is observer pattern? | 11.  What does actor represent in use case diagram? |
| 2.  What is class diagram? | 12.  What is layered architecture? |
| 3.  List the characteristics of unified process. | 13.  Define 100% rule. |
| 4.  Define actor in use case diagram. | 14.  What is abstract class? |
| 5.  What are the types of interaction diagram? | 15.  When "includes" is used in use case diagram? |
| 6.  What is dynamic model? | 16.  What is the use of activity diagram? |
| 7.  Define a conceptual class. | 17.  List three kinds of actor. |
| 8.  When an aggregation is said to be composite aggregation? | 18.  What is domain model? |
| 9.  What is activity diagram? | 19.  What is meant by low |
| 10. List any two types of common association. | 20.  What is component diagram? |

| 2019 (make up) | 2019 TU |
|---|---|
| 21. List the relationships that can exist between use cases. | 31.  What do you mean by low coupling? |
| 22. What is the role of creator | 32.  What is 'includes' in use case? |
| 23. Why is high cohesion important for software? | 33.  What are the strategies to find conceptual classes? |
| 24. Define conceptual class. | 34.  When are Specification Conceptual Classes Required? |
| 25. What does role specify while assigning relationship between classes? | 35.  Why an activity diagram is needed in behavioral modeling? |
| 26. Which UML diagram is used to describe functional requirement? | 36.  What is collaboration diagram? |
| 27. Which symbols are used to represent private and protected members in class diagram? | 37.  Define adapter design pattern. |
| 28. Differentiate between abstract class and concrete class. | 38.  List any five GRASP patterns. |
| 29. List the possible relationships between classes. | 39.  Why high cohesive design is needed? |
| 30. What is the task performed in elaboration phase? | 40.  What do you mean by iterative development method? |

| 2022 | 2023 |
|---|---|
| 41. Why do we need interface? | 51.  Why is UML regarded both as a tool and a language? |
| 42. What is the importance of Use-Case Generalization? | 52.  How do we represent abstract class and interface in a class diagram? |
| 43. List any two symbols and their task used in activity diagram. | 53.  Define description class. |
| 44. Why should we prepare deployment diagram? | 54.  List the components of use case diagram. |
| 45. Give an example of association and composition. | 55.  Why should inception phase be of short duration? |
| 46. What is an iteration? | 56.  Define UML state diagram. |
| 47. How can we achieve high cohesion? | 57.  What are the input and output artifacts of elaboration phase? |
| 48. How do we represent abstract class and interface in the descriptive class diagram? | 58.  How can we avoid a direct coupling between two or more elements? |
| 49. Why does OOAD prefer low coupling? Notes | 59.  Define 100% rule. |
| 50. How can State Diagram be used for modeling dynamic behavior of the system? | 60.  What is domain model? |

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Here are answers to the questions you listed:

 2017

1. Observer Pattern: This behavioral design pattern defines a one-to-many dependency between objects. When one object (the subject) changes state, all dependent objects (observers) are notified and updated automatically.

**2. Class Diagram:** A class diagram is a type of UML diagram that describes the static structure of a system by showing its classes, their attributes, methods, and the relationships between the classes.

**3. Characteristics of Unified Process:**
  - Iterative and incremental development
  - Phases: Inception, Elaboration, Construction, and Transition
  - Focus on risk management
  - Use-case driven
  - Architecture-centric

**4. Actor in Use Case Diagram:** An actor represents a user or another system that interacts with the system being modeled. Actors initiate use cases and interact with the system's functionality.

**5. Types of Interaction Diagrams:**
  - Sequence Diagrams
  - Collaboration Diagrams (also known as Communication Diagrams)

**6. Dynamic Model:** A dynamic model describes the behavior of a system over time, focusing on how the system responds to events and changes state. It includes models like sequence diagrams and state diagrams.

**7. Conceptual Class:** A conceptual class is a class that represents a key concept in the problem domain, usually reflecting real-world entities or abstractions. It's used in the conceptual model to define what should be modeled.

**8. Composite Aggregation:** Aggregation is considered composite when it represents a whole-part relationship with a strong lifecycle dependency, meaning the lifetime of the part is dependent on the lifetime of the whole. If the whole is destroyed, the parts are too.

**9. Activity Diagram:** An activity diagram represents the workflow or activities of a system or process. It shows the sequence of actions, decisions, and parallel processes.

**10. Two Types of Common Association:**
  - Unidirectional Association: One class is aware of another, but not vice versa.
  - Bidirectional Association: Both classes are aware of each other.

 **2018**
**11. Actor in Use Case Diagram:** An actor represents a role that interacts with the system. It can be a user, another system, or any external entity that interacts with the system's functionalities.

**12. Layered Architecture:** Layered architecture is a software design pattern where the system is divided into layers with each layer having specific responsibilities. Typically, layers include presentation, business logic, and data access.

**13. 100% Rule:** The 100% rule states that all the requirements of a system should be represented in the use case diagram. It ensures that all functional requirements are covered by use cases.

**14. Abstract Class:** An abstract class is a class that cannot be instantiated on its own and is intended to be subclassed. It may include abstract methods that must be implemented by its subclasses.

**15. Includes in Use Case Diagram:** "Includes" represents a relationship where one use case (the base use case) includes the behavior of another use case (the included use case). It's used to reuse common functionality.

**16. Use of Activity Diagram:** Activity diagrams are used to model the flow of control or data within a system. They help visualize and understand workflows, process sequences, and decision points.

**17. Three Kinds of Actor:**
  - Primary Actor: Initiates a use case to achieve a goal.
  - Secondary Actor: Provides a service or input to the system.
  - Supporting Actor: Helps with the execution of a use case but isn't directly involved.

**18. Domain Model:** A domain model represents the concepts and relationships within a specific problem domain. It's a conceptual model that provides a high-level view of the system's structure.

**19. Low Coupling:** Low coupling refers to a design principle where classes or components have minimal dependencies on each other. This enhances modularity and reduces the impact of changes in one part of the system on others.

**20. Component Diagram:** A component diagram describes the physical components of a system and their dependencies. It shows how different components (like executables, libraries, or files) are organized and interact.

 **2019 (Make-Up)**
**21. Relationships Between Use Cases:**
  - Includes: Represents a relationship where one use case includes the functionality of another.
  - Extends: Represents an optional behavior that extends the base use case.
  - Generalization: Represents a relationship where a use case inherits behavior from another use case.

**22. Role of Creator:** The creator role in design patterns specifies which class is responsible for creating instances of another class. It helps in delegating object creation responsibilities to appropriate classes.

**23. Importance of High Cohesion:** High cohesion means that a class or module is focused on a single task or responsibility. It makes the system more understandable, maintainable, and reliable, as changes in one part have minimal impact on others.

**24. Conceptual Class:** (Same as previously defined) A conceptual class represents key concepts in the problem domain, often corresponding to real-world entities or abstractions.

**25. Role in Class Relationships:** A role specifies the function or responsibility of a class in a relationship. It defines how the class participates in the association, aggregation, or composition with other classes.

**26. UML Diagram for Functional Requirement:** Use Case Diagram is used to describe functional requirements by depicting the interactions between actors and the system's use cases.

**27. Symbols for Private and Protected Members:**
  - Private Members: Represented with a minus sign (-).
  - Protected Members: Represented with a hash sign (#).

**28. Abstract Class vs. Concrete Class:**
  - Abstract Class: Cannot be instantiated; contains abstract methods that must be implemented by subclasses.
  - Concrete Class: Can be instantiated and provides implementations for all its methods.

**29. Possible Relationships Between Classes:**
  - Association
  - Aggregation
  - Composition
  - Inheritance (Generalization)

- Dependency

**30. Task in Elaboration Phase:** The elaboration phase involves refining the system's architecture, addressing high-risk elements, and establishing a detailed project plan. It includes developing detailed use cases and system requirements.

**2019 TU**

**31. Low Coupling:** (Same as previously defined) Low coupling means that components or classes have minimal dependencies on each other, which improves modularity and makes the system easier to maintain and understand.

**32. Includes in Use Case:** (Same as previously defined) The "includes" relationship is used when one use case's behavior is included in the execution of another use case.

**33. Strategies to Find Conceptual Classes:**
  - Identify Nouns: Extract nouns from requirements and domain descriptions.
  - Identify Verbs: Look for verbs that imply actions or processes.
  - Analyze Use Cases: Derive classes from the main activities and interactions described in use cases.

**34. Specification of Conceptual Classes Required:** Specification is needed when defining the detailed attributes, operations, and constraints of conceptual classes, which is crucial for accurate system modeling and design.

**35. Need for Activity Diagram in Behavioral Modeling:** Activity diagrams help visualize workflows, identify potential bottlenecks, and understand the sequence of activities and decision points within a process.

**36. Collaboration Diagram:** A collaboration diagram (or communication diagram) shows how objects interact and collaborate to achieve a goal. It emphasizes the relationships and communication between objects.

**37. Adapter Design Pattern:** The adapter pattern allows incompatible interfaces to work together. It acts as a bridge by converting the interface of a class into another interface that clients expect.

**38. Five GRASP Patterns:**
  - Information Expert
  - Creator
  - Controller
  - Low Coupling
  - High Cohesion

**39. Need for High Cohesion:** High cohesion ensures that a class or module performs a single, well-defined task, making the system easier to understand, maintain, and modify. It leads to better organization and reduced interdependence.

**40. Iterative Development Method:** An iterative development method involves repeating cycles of development where each iteration refines and builds upon the previous one. It allows for incremental progress and continuous improvement.

**2022**

**41. Need for Interface:** Interfaces provide a way to define a contract that classes must adhere to, promoting flexibility, reusability, and decoupling. They allow for different implementations to be used interchangeably.

**42. Importance of Use-Case Generalization:** Use-case generalization allows for the reuse of common functionality across multiple use cases by defining a general use case and extending it with specific use cases.

**43. Two Symbols in Activity Diagram:**

- Action/Activity Node: Represented by a rounded rectangle, it denotes a task or operation.
- Decision Node: Represented by a diamond shape, it shows a decision point with multiple outcomes.

**44. Importance of Deployment Diagram:** Deployment diagrams show the physical arrangement of hardware and software components, helping in understanding system deployment, configuration, and interactions between components.

**45. Example of Association and Composition:**
  - Association: A teacher and a student have an association where a teacher can teach multiple students.
  - Composition: A house and its rooms, where rooms are parts of the house and cannot exist independently.

**46. Iteration:** An iteration refers to a single cycle of the development process where a specific set of tasks or features is developed, tested, and reviewed. It is a part of the iterative development methodology.

**47. Achieving High Cohesion:** High

cohesion can be achieved by ensuring that each class or module has a single, well-defined responsibility and by organizing related functions and data together.

**48. Representation of Abstract Class and Interface:**
  - Abstract Class: Represented with italics or with a label indicating "abstract" in a class diagram.
  - Interface: Represented with a stereotype «interface» or with a label indicating "interface."

**49. OOAD Preference for Low Coupling:** Low coupling is preferred in Object-Oriented Analysis and Design (OOAD) because it minimizes dependencies between classes, making the system more modular, easier to maintain, and more flexible to changes.

**50. State Diagram for Dynamic Behavior:** A state diagram models the different states an object can be in and how it transitions between states based on events. It helps in understanding and managing the dynamic behavior of the system.

**2023**

**51. UML as Tool and Language:** UML is regarded as both a tool and a language because it provides a standardized set of visual notations (language) for modeling systems and also offers tools for creating and analyzing these models.

**52. Representation of Abstract Class and Interface:**
  - Abstract Class: Represented with italicized class names or a specific notation for abstract classes.
  - Interface: Represented with the «interface» stereotype or a specific notation indicating an interface.

**53. Description Class:** A description class provides additional information about the roles, responsibilities, and behavior of a class. It's often used to provide context or documentation for classes in a system.

**54. Components of Use Case Diagram:**
  - Actors: Represent entities that interact with the system.
  - Use Cases: Represent the functionalities or services provided by the system.
  - Relationships: Include associations, includes, extends, and generalizations.

**55. Short Duration of Inception Phase:** The inception phase should be short to quickly validate the project's feasibility, gather initial requirements, and create a basic project plan, avoiding prolonged planning that could delay development.

**56. UML State Diagram:** A state diagram represents the states of an object and the transitions between these states based on events. It helps model the dynamic behavior and lifecycle of an object.

**57. Input and Output Artifacts of Elaboration Phase:**
  - **Input: Initial requirements, project vision, use cases.**
  - **Output: Refined architecture, risk assessment, detailed project plan.**

**58. Avoiding Direct Coupling:** To avoid direct coupling, use design principles such as dependency injection, interfaces, or abstract classes to manage dependencies and promote loose coupling between components.

**59. 100% Rule:** (Same as previously defined) The 100% rule ensures that all functional requirements are represented by use cases in the use case diagram, providing complete coverage of the system's functionality.

**60. Domain Model:** (Same as previously defined) A domain model represents the key concepts, entities, and relationships within a problem domain, providing a high-level view of the system's structure and behavior.