

Question 1: In Python, which of the following best describes a generator expressed with yield?

- a) Returns a value and pauses function state for later resumption.
- b) Immediately returns a list containing all values.
- c) Deletes variables after yielding.
- d) Converts function to a class automatically.

Question 2: Which data structure gives $O(1)$ average-time complexity for membership tests and insertions?

- a) Singly linked list
- b) Hash table (hash set)
- c) Binary search tree (unbalanced)
- d) Queue

Question 3: A web app shows slow page loads only when many users upload images simultaneously. Which is the most effective initial step?

- a) Profile server-side request handling and check asynchronous upload handling and storage I/O bottlenecks.
- b) Immediately rewrite the entire frontend in another framework.
- c) Remove authentication to speed things up.
- d) Increase font size to distract users.

Question 4: In Big-O terms, which is the worst-case time complexity of quicksort with a poor pivot choice?

- a) $O(n \log n)$
- b) $O(n^2)$
- c) $O(n)$
- d) $O(\log n)$

Question 5: Which statement about supervised v/s unsupervised learning is correct?

- a) Supervised learning uses labelled data; unsupervised uses unlabelled and finds structure.
- b) Supervised learning always requires reinforcement.
- c) Unsupervised learning predicts next state labels.
- d) Supervised learning does not use training data.

Question 6: “Which mandatory attribute on improves accessibility and SEO by describing the image content?”

- a) alt
- b) bordercolour
- c) align
- d) colour

Question 7: Which cryptographic primitive ensures integrity verification but does not ensure confidentiality?

- a) Symmetric encryption (AES)
- b) Hash function (SHA-256)
- c) Asymmetric encryption (RSA)
- d) Steganography

Question 8: Which algorithmic technique is used by Dijkstra’s algorithm?

- a) Dynamic programming with memorization
- b) Greedy method (shortest path in non-negative weighted graph)
- c) Divide and conquer sorting
- d) Backtracking search

Question 9: You must build a model to detect images of cats v/s dogs with many labelled images. Which approach is most appropriate?

- a) Train a convolutional neural network (CNN) with a suitable architecture or pre-trained transfer learning.
- b) Use k-means clustering on raw pixels only.
- c) Use linear regression on image filenames.
- d) Use an LRU cache.

Question 10: Which access control model restricts permissions based on roles assigned to users?

- a) Discretionary Access Control (DAC)
- b) Role-Based Access Control (RBAC)
- c) Mandatory Access Control (MAC) only for OS kernels
- d) Open access control

Question 11: Which Python construct is best to ensure a file is closed even when exceptions occur?

- a) try/finally or with context manager (with open(...) as f:)
- b) Just open () without handling
- c) if statements only
- d) while True loop

Question 12: In a balanced binary search tree (AVL), which operation keeps height balanced after insertions?

- a) Rotations (single or double) to restore balance factor limits
- b) Rehashing the tree with modulo arithmetic
- c) Converting tree to list every time
- d) Doing nothing; AVL trees never need rebalancing

Question 13: Which statement about over fitting in machine learning is true?

- a) Over fitting occurs when a model learns noise and performs well on training but poorly on unseen data.
- b) Over fitting improves generalization on test data always.
- c) Over fitting is eliminated by increasing model complexity only.
- d) Over fitting only happens with linear regression.

Question 14: In web development, what does CORS control?

- a) Font rendering on remote hosts
- b) Whether a browser allows cross-origin HTTP requests from one origin to another
- c) Database replication across regions
- d) CSS specificity rules

Question 15: For finding k-th smallest element in an unsorted array, which has expected linear time?

- a) QuickSelect
- b) Full quicksort and then index access ($O(n \log n)$)
- c) Bubble sort then pick k-th
- d) Reversing array

Question 16: Which layer of the OSI model handles routing of packets between networks?

- a) Session layer
- b) Network layer (e.g., IP)
- c) Presentation layer
- d) Application layer

Question 17: Which Python data type is immutable?

- a) list
- b) dict
- c) tuple
- d) set

Question 18: In Big-O for searching in a sorted array with binary search, what is the time complexity?

- a) $O(\log n)$
- b) $O(n)$
- c) $O(n \log n)$
- d) $O(1)$

Question 19: A penetration tester finds SQL injection on a login form. Which immediate mitigation should developers implement?

- a) Use parameterized queries / prepared statements and input validation; avoid string concatenation for SQL.
- b) Hide the login form using CSS.
- c) Change database vendor only.
- d) Remove authentication altogether.

Question 20: Which data structure is best for implementing an LRU (Least Recently Used) cache with $O(1)$ operations?

- a) Array only
- b) Doubly linked list + hash map (dictionary)
- c) Single stack
- d) Priority queue with linear search

Question 21: Which machine-learning evaluation metric is most informative for an imbalanced binary classification with rare positive class?

- a) Accuracy only
- b) Precision, recall, and F1-score (especially recall/precision trade-off)
- c) Sum of predictions
- d) Mean squared error

Question 22: Which HTTP status code indicates “Resource Not Found”?

- a) 200
- b) 301
- c) 404
- d) 500

Question 23: Which sorting algorithm guarantees $O(n \log n)$ worst-case time?

- a) Quick sort
- b) Merge sort
- c) Bubble sort
- d) Insertion sort

Question 24: A model’s training loss decreases while validation loss increases. Which technique should you try first?

- a) Apply regularization (dropout, L2), reduce model complexity, or get more data
- b) Increase learning rate drastically.
- c) Remove validation set.
- d) Always keep training longer no matter what.

Question 25: Which statement about public-key cryptography (asymmetric) is correct?

- a) Public-key algorithms use a key pair
- b) Same key is used for encryption and decryption always.
- c) Asymmetric cryptography is always faster than symmetric.
- d) It never uses mathematical number theory.

Question 26: Which web performance optimisation reduces initial page load by deferring non-critical JS?

- a) Inline all scripts at top of body
- b) Use defer or a sync attributes and code-splitting to postpone non-essential scripts
- c) Use synchronous XHR for all requests
- d) Replace HTML with plaintext only

Question 27: Which algorithm uses divide-and-conquer and is stable if implemented carefully?

- a) Merge sort
- b) Quick sort
- c) Selection sort
- d) Heap sort

Question 28: A deployed recommendation system begins to show biased outputs favouring one group. What is an appropriate corrective workflow?

- a) Audit dataset and model fairness metrics, identify bias sources, retrain with balanced data / fairness-aware techniques, and monitor post-deployment.
- b) Remove recommendations entirely.
- c) Blame users only.
- d) Reduce logging to hide issues.

Question 29: In Java, which keyword prevents a method from being overridden in subclasses?

- a) final
- b) static
- c) abstract
- d) transient

Question 30: Which graph traversal guarantees visiting nodes in order of increasing path length from a starting node in an unweighted graph?

- a) Depth-first search (DFS)
- b) Breadth-first search (BFS)
- c) Topological sort
- d) Greedy best-first

Question 31: Which attack is mitigated by using HTTPS (TLS)?

- a) Cross-site scripting (XSS) only
- b) Man-in-the-middle eavesdropping and tampering of HTTP traffic
- c) SQL injection in server logic
- d) Server-side memory leak

Question 32: A function does nested loops: for i in 1..n: for j in 1..i: constant work. What is time complexity?

- a) $O(n)$
- b) $O(n^2)$ (since $\sum_{i=1..n} i = n(n+1)/2$)
- c) $O(n \log n)$
- d) $O(\log n)$

Question 33: Which activation function is commonly used in deep neural networks to mitigate vanishing gradient and provide sparsity?

- a) Sigmoid always best
- b) ReLU (Rectified Linear Unit)
- c) Linear identity only
- d) Step function

Question 34: Which HTTP method is idempotent and typically replaces a resource fully?

- a) POST
- b) PUT
- c) PATCH
- d) CONNECT

Question 35: You need a priority queue for scheduling tasks with changing priorities; which supports efficient decrease-key (amortized)?

- a) Binary heap
- b) Fibonacci heap
- c) Unordered list
- d) Stack

Question 36: In Python, what does __init__ method inside a class do?

- a) Constructor
- b) Deletes the class.
- c) Defines static methods only.
- d) Runs only at module import.

Question 37: A company detects unusual outbound traffic from a server to unknown IPs. Which immediate triage action is best?

- a) Isolate (segment) the server from the network, preserve forensic logs, and begin containment & investigation.
- b) Reboot the server without logging.
- c) Publish server credentials on the site to gather more logs.
- d) Change wallpaper on server.

Question 38: Which complexity class describes problems verifiable in polynomial time?

- a) P
- b) NP
- c) EXP
- d) LOGSPACE

Question 39: Which technique helps prevent cross-site scripting (XSS) attacks?

- a) Always allow all user input to be rendered raw.
- b) Properly escape or sanitize user
- c) Use only client-side validation.
- d) Block CSS files.

Question 40: Which ML approach is best when labelled data is abundant and your objective is classification?

- a) Supervised learning
- b) Unsupervised clustering only
- c) Reinforcement learning always
- d) Manual heuristics only

Question 41: A web app's backend becomes a monolith that hinders scaling different components independently. What is a recommended architectural change?

- a) Consider decomposing into micro services with well-defined APIs and scale services independently.
- b) Merge more modules into the same process to simplify.
- c) Replace database with CSV files.
- d) Convert to desktop app only.

Question 42: In algorithm design, what is amortized analysis used for?

- a) Average cost per operation over a sequence of operations
- b) Encrypting analysis results
- c) Only for sorting algorithms
- d) To prove $P = NP$

Question 43: Which HTTP header helps mitigate clickjacking by controlling frame ancestors?

- a) X-Frame-Options or Content-Security-Policy
- b) Content-Type only
- c) Server header
- d) Cache-Control only

Question 44: Which ML technique uses a loss function and gradient descent to update parameters?

- a) K-means clustering without gradient-based optimization
- b) Neural networks and many parametric models trained by gradient descent variants
- c) Pure rule-based expert systems
- d) Static HTML generation

Question 45: A heavy SQL query joining many tables causes timeouts. Which is a targeted optimisation?

- a) Add appropriate indexes, examine query plan, denormalize if needed, and limit result set with pagination.
- b) Increase page font size.
- c) Write same query in a different programming language.
- d) Always drop indexes to speed up joins.

Question 46: Which data serialization format is compact, human-readable, and commonly used in web APIs?

- a) BSON only
- b) JSON
- c) Binary executable format
- d) Plain text without structure

Question 47: Which cyber-attack exploits buffer overflow to execute arbitrary code?

- a) Cross-site request forgery (CSRF)
- b) Stack-based buffer overflow exploit (memory corruption vulnerability)
- c) SQL injection only
- d) Phishing by email

Question 48: A model performs well offline but stalls on real-time data due to input distribution shift. What is a robust approach?

- a) Implement monitoring for data drift, retrain model with representative live data, and possibly use online learning or periodic re-training.
- b) Shut down the service permanently.
- c) Remove validation pipeline.
- d) Replace model with a random predictor.

Question 49: In web security, what is CSRF (Cross-Site Request Forgery)?

- a) An attack that forces a user's browser to execute unwanted actions in a web application in which they are authenticated.
- b) A virus on the server's disk.
- c) A client-side style error.
- d) An SQL-specific vulnerability.

Question 50: Which data structure is ideal for implementing undo functionality (last action undone first)?

- a) Queue (FIFO)
- b) Stack (LIFO)
- c) Hash table
- d) Binary search tree

Question 51: For a multi-class classification with heavily imbalanced classes, which evaluation choice is appropriate?

- a) Use macro
- b) Use accuracy only.
- c) Use mean squared error metric.
- d) Use number of parameters only.

Question 52: Which principle is central to Agile web development for responsive iterations?

- a) Heavy upfront specification without changes
- b) Iterative development with frequent feedback (sprints) and continuous integration
- c) No testing at all
- d) Single long release cycle every five years

Question 53: Which of the following best describes a trie (prefix tree) use-case?

- a) Fast prefix searches and auto-completion for a set of strings
- b) Random-access constant-time lookup for numeric IDs only
- c) Sorting floating-point numbers fastest
- d) Storing large binary blobs

Question 54: Which attack vector is primarily mitigated by the SameSite cookie attribute?

- a) Clickjacking
- b) Cross-site request forgery (CSRF) by restricting cookie sending for cross-site requests
- c) Buffer overflow
- d) SQL injection

Question 55: You designed a greedy algorithm for a resource allocation problem. What is the correct next step before deploying it?

- a) Prove correctness (optimality) theoretically or show counterexamples and test extensively on varied inputs; compare with optimal/approx. methods.
- b) Ship immediately without tests.
- c) Assume greedy always works for any problem.
- d) Only run on trivial inputs.

Question 56: Which technique reduces over fitting by combining predictions of multiple models (ensemble)?

- a) Bagging and boosting
- b) Single decision stump only
- c) Using raw data without models
- d) Increasing number of features only

Question 57: Which HTTP status code signals a successful request where a new resource was created?

- a) 201
- b) 403
- c) 302
- d) 418

Question 58: A teammate's function is 300 lines long with deep nesting. Which is the best refactoring approach?

- a) Break into smaller functions with clear single responsibility, add tests, and improve naming and documentation.
- b) Increase nesting and add comments only.
- c) Convert to a single huge global script.
- d) Remove all comments and tests.

Question 59: Which neural network regularisation technique randomly disables units during training to reduce co-adaptation?

- a) Batch normalization only
- b) Dropout
- c) L1 regularization only
- d) Data augmentation only

Question 60: Which HTTP header sets content type for responses to indicate JSON payload?

- a) Content-Type
- b) X-Powered
- c) Server
- d) Authorization