

**Class 5 | Cyber Olympiad**

**Instructions:** Each question has one correct answer. Choose the best option (A/B/C/D). Answer key is provided at the end. This paper is for practice only — not an official exam paper. Recommended time: **45 minutes**.

**Q1.** What is the time complexity of quicksort in the average case?

A.  $O(n)$

B.  $O(n \log n)$

C.  $O(n^2)$

D.  $O(\log n)$

**Q2.** In Python, what does 'yield' do in a function?

A. returns a value and terminates the function

B. creates a generator that yields values one at a time without exhausting memory

C. imports a module

D. catches exceptions

**Q3.** What is the Two's Complement of 8-bit binary 00001010?

A. 11110101

B. 11110110

C. 00001010

D. 11111010

**Q4.** In networking, what does 'subnet mask' do?

A. encrypts the network traffic

B. divides an IP network into smaller sub-networks

C. assigns MAC addresses

D. translates domain names to IPs

**Q5.** What is a 'binary search tree' (BST) property?

A. all children are equal to the parent

B. left child > parent > right child

C. left child < parent < right child

D. all nodes are at the same level

**Q6.** In Python, what does 'map(func, iterable)' do?

A. filters elements based on a condition

B. applies func to every element of iterable and returns an iterator

C. sorts the iterable using func as key

D. combines two iterables

**Q7.** What is 'deadlock' in operating systems?

**A.** a program running at maximum speed

**B.** a state where two or more processes wait for each other's resources indefinitely

**C.** a type of memory leak

**D.** a process that has crashed

**Q8.** In cryptography, RSA encryption is based on:

**A.** the difficulty of reversing XOR operations

**B.** the difficulty of factoring the product of two large prime numbers

**C.** the discrete logarithm problem

**D.** the one-way property of SHA-256

**Q9.** What is 'DFS' (Depth-First Search) used for?

**A.** sorting elements in a list

**B.** searching every path in a graph or tree, going as deep as possible first

**C.** finding the shortest path in a weighted graph

**D.** sorting a binary tree

**Q10.** In Python, what does 'filter(func, iterable)' return?

**A.** elements transformed by func

**B.** a sorted version of iterable

**C.** elements of iterable for which func returns True

**D.** the sum of all elements

**Q11.** What is 'virtualisation' in computing?

**A.** rendering 3D graphics

**B.** creating virtual hardware layers so multiple OS can run on one physical machine

**C.** simulating a network attack

**D.** encrypting a hard drive

**Q12.** In SQL, 'JOIN' combines rows from two tables based on:

**A.** alphabetical order

**B.** date of insertion

**C.** a related column between the tables

**D.** the number of rows

**Q13.** What is the 'CAP theorem' in distributed systems?

**A.** a distributed system can always guarantee all three: Consistency, Availability, Partition tolerance

**B.** a distributed system can guarantee at most two of: Consistency, Availability, Partition tolerance

**C.** distributed systems cannot be consistent

**D.** availability is more important than consistency

**Q14.** In Python, what does @staticmethod mean?

**A.** the method can only be called once

**B.** the method can access only class variables

**C.** the method belongs to the class but does not receive the instance (self) or class (cls) as a parameter

**D.** the method cannot be overridden

**Q15.** What is the purpose of a 'load balancer' in web architecture?

**A.** compress data before sending

**B.** distribute incoming network traffic across multiple servers

**C.** cache database queries

**D.** encrypt HTTP traffic

**Q16.** In graph theory, a 'spanning tree' of a connected graph has:

**A.** cycles to reduce path length

**B.** all vertices and minimum edges to connect them without cycles

**C.** only the root node and leaves

**D.** directed edges only

**Q17.** What does 'mutable' mean in Python?

**A.** the object can be changed after creation

**B.** the object cannot be changed after creation

**C.** the object has multiple data types

**D.** the object is a function

**Q18.** In machine learning, 'overfitting' occurs when a model:

**A.** performs poorly on training data

**B.** performs well on training data but poorly on new data

**C.** cannot learn any patterns

**D.** requires too little training data

**Q19.** What is the purpose of 'Docker' containers?

**A.** manage user passwords

**B.** monitor network traffic

**C.** package applications with all dependencies so they run consistently across environments

**D.** encrypt database records

**Q20.** In Python, what is the difference between 'is' and '=='?

**A.** 'is' compares values; '==' compares identity

**B.** they are identical in all cases

**C.** 'is' compares object identity (same memory location); '==' compares values

**D.** 'is' works only on strings

**Q21.** In asymptotic notation,  $O(1)$  means:

**A.** the algorithm always runs in one step

**B.** the algorithm's time grows linearly

**C.** constant time — the runtime does not depend on input size

**D.** the algorithm cannot run

**Q22.** What is 'CSRF' (Cross-Site Request Forgery)?

**A.** injecting malicious SQL into a query

**B.** tricking a user's browser into making an unwanted request to a site where they are authenticated

**C.** intercepting network traffic

**D.** brute-forcing a password

**Q23.** What is a 'REST API'?

**A.** a database management system

**B.** an architecture for web services using HTTP methods (GET, POST, PUT, DELETE)

**C.** a type of encryption

**D.** a programming language

**Q24.** In Python, 'with open("file.txt") as f:' is preferred because:

**A.** it opens files faster

**B.** it automatically closes the file even if an error occurs

**C.** it allows writing and reading simultaneously

**D.** it prevents all exceptions

**Q25.** The 'PageRank' algorithm (used by Google) ranks pages based on:

**A.** the number of words on each page

**B.** how recently the page was updated

**C.** the number and quality of links pointing to a page

**D.** keyword density

**Q26.** What does 'SOLID' stand for in software design principles?

**A.** Safety, Originality, Logic, Integrity, Design

**B.** Single responsibility, Open/closed, Liskov substitution, Interface segregation, Dependency inversion

**C.** Scalable, Optimal, Logical, Integrated, Dynamic

**D.** Secure, Open, Linked, Iterative, Distributed

**Q27.** In Python, what is a 'context manager'?

**A.** a class that manages program context

**B.** a function that imports modules

**C.** an object that defines setup and teardown using `__enter__` and `__exit__`

**D.** a decorator that limits function calls

**Q28.** What is 'buffer overflow'?

**A.** too much data is stored in RAM

**B.** a program writes data beyond a buffer's boundary, overwriting adjacent memory

**C.** the CPU overheats

**D.** the network packet is too large

**Q29.** In machine learning, 'gradient descent' is used to:

**A.** increase model complexity

**B.** minimise the loss function by iteratively adjusting weights

**C.** select training data

**D.** split datasets

**Q30.** What is 'dynamic programming'?

**A.** writing programs that change at runtime

**B.** a technique solving complex problems by breaking them into overlapping subproblems and storing solutions

**C.** a scripting approach without classes

**D.** optimising memory allocation

**Q31.** In Python, what is the output of: `[i for i in range(10) if i % 2 == 0]`?

**A.** [1, 3, 5, 7, 9]

**B.** [2, 4, 6, 8, 10]

**C.** [0, 2, 4, 6, 8]

**D.** [0, 1, 2, 3, 4]

**Q32.** What is 'SQL injection'?

**A.** inserting images into SQL databases

**B.** injecting malicious SQL code into input fields to manipulate a database

**C.** using SQL to hack a network

**D.** optimising SQL queries for speed

**Q33.** In Python, what does 'collections.defaultdict' provide?

**A.** a sorted dictionary

**B.** a dictionary that raises `KeyError` for missing keys

**C.** a dictionary that provides a default value for missing keys

**D.** an immutable dictionary

**Q34.** What is 'Dijkstra's algorithm' used for?

**A.** sorting an array

**B.** finding the shortest path in a weighted graph with non-negative weights

**C.** balancing a binary search tree

**D.** detecting cycles in a graph

**Q35.** In computer architecture, 'pipelining' refers to:

**A.** connecting multiple CPUs

**B.** overlapping instruction fetch, decode, and execute stages to increase throughput

**C.** running programs in virtual machines

**D.** transferring data via cable

**Q36.** What is the 'halting problem' in computer science?

**A.** a loop that runs too slowly

**B.** the undecidable problem of determining whether a given program will halt or run forever on a given input

**C.** a program that crashes on halted hardware

**D.** an operating system freeze

**Q37.** In Python, what does 'enumerate(iterable)' return?

**A.** the length of the iterable

**B.** pairs of (index, value) for each element

**C.** sorted elements

**D.** unique elements only

**Q38.** Which of the following best describes 'DevOps'?

**A.** a programming language for deployment

**B.** a culture/practice combining software development and IT operations for faster, reliable delivery

**C.** a database management system

**D.** a type of network protocol

**Q39.** What is 'zero-day vulnerability'?

**A.** a bug discovered on the first day of software release

**B.** a security flaw unknown to the vendor, exploited before a patch is available

**C.** a vulnerability with zero severity

**D.** a day when no new vulnerabilities are found

**Q40.** In Python's multiprocessing, 'GIL' (Global Interpreter Lock) limits:

**A.** memory usage

**B.** the number of processes

**C.** the ability of multiple threads to execute Python bytecode simultaneously in CPython

**D.** the speed of I/O operations

### Answer Key

Q1: B    Q2: B    Q3: B    Q4: B    Q5: C    Q6: B    Q7: B    Q8: B    Q9: B    Q10: C  
Q11: B    Q12: C    Q13: B    Q14: C    Q15: B    Q16: B    Q17: A    Q18: B    Q19: C  
Q20: C    Q21: C    Q22: B    Q23: B    Q24: B    Q25: C    Q26: B    Q27: C    Q28: B  
Q29: B    Q30: B    Q31: C    Q32: B    Q33: C    Q34: B    Q35: B    Q36: B    Q37: B  
Q38: B    Q39: B    Q40: C

