FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2026 FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT

Roll Number

COMPUTER SCIENCE, PAPER-I

TIME ALLOWED: THREE HOURS **PART-I (MCQs) : MAXIMUM 30 MINUTES**	**(PART-I MCQs) MAXIMUM MARKS: 20** **(PART-II) MAXIMUM MARKS: 80**

NOTE: (i) First attempt **PART-I (MCQs)** on separate **OMR Answer Sheet** which shall be taken back after **30 minutes.**
(ii) Overwriting/cutting of the options/answers will not be given credit.
(iii) There is **no negative** marking. All MCQs must be attempted.

PART-I (MCQs)(COMPULSORY)

Q.1. (i) Select the best option/answer and fill in the appropriate Box ☐ on the **OMR Answer Sheet.(20x1=20)**
(ii) Answers given anywhere else, other than OMR Answer Sheet, will not be considered.

1. **A company wants to upgrade its storage media for fastest possible data access. Which one is the best option?**
   (A) Hard Disk Drive (HDD) (B) Optical Drive (C) Solid State Drive (SDD) (D) None of these
2. **A programmer is developing software and needs to consider ethical challenges. What is a major concern?**
   (A) Data encryption (B) Plagiarism (C) User interface (D) None of these
3. **A programmer wants to group different data types. What should he/she use?**
   (A) Structures (B) Arrays (C) Unions (D) None of these
4. **A class needs to allow different implementations of a method. What concept to use?**
   (A) Inheritance (B) Polymorphism (C) Encapsulation (D) None of these
5. **What is the purpose of using virtual functions in inheritance?**
   (A) To prevent overriding (B) To hide members (C) To enable polymorphism (D) None of these
6. **How does the history of computing influence modern computer architecture?**
   (A) By dictating hardware design (B) By shaping software development
   (C) By influencing both hardware and software (D) None of these
7. **A function needs to modify an input variable. How should the parameter be passed?**
   (A) By value (B) By reference (C) By pointer (D) None of these
8. **A developer wants to define a class with methods that can be used with different data types. What to use?**
   (A) Templates (B) Inheritance (C) Polymorphism (D) None of these
9. **Which operator is typically overloaded for stream insertion?**
   (A) << (B) >> (C) + (D) None of these
10. **What does the Standard Template Library (STL) provide in C++?**
    (A) Pre-defined classes for GUI (B) Pre-defined functions for math operations
    (C) Pre-defined containers and algorithms (D) None of these
11. **You are analyzing an algorithm's efficiency. What do you consider?**
    (A) Code length (B) Time and space complexity (C) Programmer's experience (D) None of these
12. **In Hash Tables, what is a collision resolution technique?**
    (A) Linear Search (B) Binary Search (C) Chaining (D) None of these
13. **In Recursion, what is crucial to prevent infinite loops?**
    (A) Base case (B) Recursive call (C) Loop usage (D) None of these
14. **You are leading an Agile team developing a mobile app. What's the primary focus?**
    (A) Detailed upfront planning (B) Strict adherence to initial requirements
    (C) Both (A) & (B) (D) Iterative development and customer feedback
15. **A compiler needs to recognize tokens. Which phase does this?**
    (A) Syntax Analysis (B) Lexical Analysis (C) Code Generation (D) None of these
16. **What is the advantage of using LL(1) grammars in the Syntax Analysis?**
    (A) More complex parsing (B) Predictive parsing with less complexity
    (C) No need for grammar rules (D) None of these
17. **What is the difference between Top-down and Bottom-up parsers?**
    (A) Top-down is always faster (B) Bottom-up handles more grammars
    (C) Top-down starts from start symbol (D) None of these
18. **What do compilers use for recognizing tokens?**
    (A) Regular expressions (B) Context-free grammars (C) Machine code (D) None of these
19. **A project is behind schedule. What is a likely Agile response?**
    (A) Add more developers (B) Work longer hours
    (C) Both (A) & (B) (D) Review scope and priorities with team
20. **A project is using open-source components with security vulnerabilities. What is the risk?**
    (A) Security breaches or compliance issues (B) Non-technical issues
    (C) Open-source issues (D) None of these

PART-II

NOTE: (i) **Part-II** is to be attempted on the separate **Answer Book.**
(ii) Attempt **ONLY FOUR** questions from **PART-II** by selecting **TWO** questions from **EACH SECTION**. **ALL** questions carry **EQUAL** marks.
(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.
(iv) Write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
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SECTION-A

Q. 2. **(a)** Your team needs to share large files quickly but email limits attachments. What computing method should they use and how will it solve the issue? **(6)**

(b) You receive an email asking for your banking details. What kind of risk or security issue this might be? How to respond? **(6)**

(c) Your office plans to upgrade hardware but employees don't know what components matter. Which computer hardware components would you explain to help them choose better systems? **(8)**

Q. 3. **(a)** What is bit manipulation in programming and why is it used? Give two examples of its use. **(6)**

(b) What are arrays? Describe one advantage and one limitation. **(6)**

(c) Write pseudocode to reverse an array using pointers. **(8)**

Q. 4. **(a)** Why cannot we instantiate an abstract class directly, even though it may contain complete functions? **(6)**

(b) A class library contains many book objects. Should this be modeled using inheritance or composition? Why? **(6)**

(c) Demonstrate **method overriding** using a base class **Account** and derived class **Current Account**. Make balance a protected data member. **(8)**

SECTION-B

Q. 5. **(a)** Why is Binary Search not suitable for an unsorted list? **(6)**

(b) What is the difference between Time Complexity and Space Complexity? Explain with examples. **(6)**

(c) Write an algorithm with an example showing how Stack can be used to evaluate a postfix expression. **(8)**

Q. 6. **(a)** Why is Maintenance the most expensive phase of the software lifecycle? **(6)**

(b) What is the purpose of Use Case Diagrams? **(6)**

(c) Why do Agile projects need frequent customer interaction? **(8)**

Q. 7. **(a)** Construct a Deterministic Finite Automaton (DFA) for the regular expression (a|b)*abb. **(6)**

(b) Explain the difference among **lexeme**, **token**, and **pattern** with examples. **(6)**

(c) Consider the three-address code: **(8)**

t1 = a + b
t2 = t1 + c
t3 = t2 + d

If the machine has only **two registers**, how should the compiler allocate registers to minimize memory spills?

Q. 8. **(a)** Suppose a lexical analyzer is scanning code and encounters the following input string: **(6)**

9var = x + 12abc;

Describe step-by-step how the lexical analyzer processes this input, identifies errors, and generates tokens. Explain which specific rules of lexical analysis it uses.

(b) A software team is building an online examination system. During requirements gathering, the client says they want "very strong security," but teachers want "fast login without multiple checks." The development team becomes confused because the requirements conflict. Explain how the team should resolve this conflict using proper Software Engineering techniques. Also describe the impact of wrong requirement handling on the SDLC. **(6)**

(c) A company maintains millions of product IDs and frequently performs searching, insertion, and deletion. The data volume is extremely large, and performance is critical. Which data structure would be most suitable—Binary Search Tree, AVL Tree, Hash Table, or Array? Justify your answer logically using time complexity and memory considerations. **(8)**

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COMPUTER SCIENCE, PAPER-II

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PART-I (MCQs)(COMPULSORY)

Q.1. (i) Select the best option/answer and fill in the appropriate Box ■ on the **OMR Answer Sheet.(20x1=20)**
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1. **Which of the following statement is true about overloading and overriding?**
   (A) Overloading and overriding is same
   (B) Overloading and overriding are different but inheritance is not involved in to implement any concept
   (C) Overloading is performed within same class but overriding is performed among different classes
   (D) None of these.
2. **Which of the following statement is true about private data members?**
   (A) Can't accessible outside class but through public methods of that class.
   (B) Can be accessible outside class using objects of that class
   (C) Can be accessible outside class (D) None of these
3. **In histogram equalization, applying the technique to each RGB channel independently often causes:**
   (A) Improved color constancy (B) Better noise suppression
   (C) Color distortions due to channel imbalance (D) None of these
4. **In a pipelined processor, what is the primary purpose of the instruction pipeline?**
   (A) To increase the clock speed of the processor (B) To execute multiple instructions simultaneously
   (C) To reduce the number of instructions in a program (D) None of these
5. **When applying a 2D Fourier Transform to an image, shifting the image spatially causes which corresponding effect in the frequency domain?**
   (A) Phase modulation (B) Amplitude scaling (C) Frequency doubling (D) None of these
6. **In morphological image operations, the key property that distinguishes opening from closing is that opening tends to:**
   (A) Fill narrow gaps (B) Remove thin protrusions (C) Produce higher contrast (D) None of these
7. **The main purpose of using a Laplacian of Gaussian (LoG) operator in image analysis is to:**
   (A) Detect extremely low-frequency patterns (B) Identify regions of uniform color
   (C) Localize edges by combining smoothing and second-order derivatives (D) None of these
8. **The Data Definition Language (DDL) describes**
   (A) How data are structured in the data base
   (B) The DBMS what is required; the techniques used to process data
   (C) How data must be structured to produce the user's view (D) None of these
9. **Data Encryption Standard (DES) generates _____ bit round keys.**
   (A) 16 (B) 32 (C) 48 (D) None of these
10. **In symmetric key cryptography, sender and the receiver uses _____ keys.**
    (A) Shared (B) Two (C) No (D) None of these
11. **In modern micro-frontend architectures, the primary benefit of independently deployed UI fragments is:**
    (A) Tighter coupling across teams (B) Improved runtime bundling only
    (C) Enhanced isolation and autonomous deployment pipelines (D) None of these
12. **HTTP/3 improves performance over HTTP/2 mainly because it:**
    (A) Uses TCP with modified congestion control (B) Replaces TLS with a custom encryption protocol
    (C) Operates over QUIC to avoid head-of-line blocking (D) None of these
13. **A major advantage of using Web Assembly in computationally intensive web applications is that it:**
    (A) Eliminates the need for JavaScript entirely (B) Enables near-native execution speed in browsers
    (C) Works only on server-side rendering engines (D) None of these
14. **The _____is one of the fundamental components of a DBMS.**
    (A) System catalogue (B) Metadata (C) Information Resource Dictionary System (D) None of these
15. **Which of the following is not a function of DBMS?**
    (A) Recovery services (B) Support for data communication (C) Funneling (D) None of these
16. **Which of the following is not involved in DBMS**?
    (A) HTML (B) Application Request (C) End Users (D) None of these
17. **In peer-to-peer networking:**
    (A) There is only one server and many clients
    (B) Every computer is capable of playing the role of client, server or both at the same time
    (C) There is only one client and many servers (D) None of these

18. **You got a hardware resource conflict, it will more likely be an IRQ conflict rather than an i/o conflict because:**
    (A) The BIOS sometimes has more of a problem controlling IRQs (B) I/O addresses cannot conflict
    (C) There are a lot more I/O addresses than IRQs. (D) None of these
19. **The part of OS which decides what to do when main memory full is:**
    (A) Process Scheduler (B) Memory Manager (C) File System (D) None of these
20. **Which of these is a method of file protection?**
    (A) Access Control (B) Deleting a file (C) Hiding a file (D) None of these

PART – II

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SECTION – A

Q. No. 2. Machine instructions serve as a critical interface between hardware and software. Compare the representation and execution behavior of machine instructions in CISC and RISC based architectures. Evaluate how the instruction-cycle organization shapes the design of the control unit hardwired vs. microprogrammed. **(20)**

Q. No. 3. Explain the synergistic relationship between instruction-level parallelism (ILP), superscalar execution, and multi-core architectures in modern CPU design. Analyze how their combined use affects the design of the instruction pipeline, the mitigation of control hazards, and the resultant overall processor throughput. **(20)**

Q. No. 4. In large-scale distributed networks, congestion control and avoidance mechanisms are essential for maintaining service quality. Provide a detailed analysis of the congestion-handling strategies employed in TCP, and contrast them with the limitations of UDP in similar conditions. Explain why transport-layer design decisions influence overall network stability. **(20)**

Q. No. 5. Modern operating systems balance efficiency and fairness while scheduling processes. Critically evaluate how multi-level feedback queues evolve process priorities over time. Discuss how this design influences CPU utilization and starvation compared to simpler scheduling algorithms. **(20)**

SECTION – B

Q. No. 6. Normalization aims to improve schema quality. Discuss how violations of functional and multivalued dependencies lead to structural anomalies. Evaluate whether higher normal forms (3NF, BCNF, 4NF) always benefit large-scale Online Transaction Processing (OLTP) databases systems. **(20)**

Q. No. 7. Morphological operations offer powerful tools to manipulate shape-based features. Discuss the mathematical foundation of dilation, erosion, opening, and closing, and evaluate their use in tasks such as document analysis or medical image preprocessing. **(20)**

Q. No. 8. Feature extraction is central to computer vision. Describe how edge detection techniques differ in their response to noise, texture, and illumination variations. Compare boundary localization accuracy among classical detectors such as Sobel, Canny, and Laplacian-based methods. **(20)**