FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2024 FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT
COMPUTER SCIENCE, PAPER-II

Roll Number

TIME ALLOWED: THREE HOURS	**(PART-I MCQs)**	**MAXIMUM MARKS: 20**
PART-I (MCQs) : MAXIMUM 30 MINUTES	**(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. **Which of the following are computer architectures different from conventional von Neumann architecture?** (A) MIT architecture (B) Harvard architecture (C) Turing architecture (D) None of these
2. **A computer is in System mode when:**
   (A) CPU is executing a program which is part of the operating system
   (B) The process execution is halted to listen to device inputs
   (C) The system is switching between processes (D) None of these
3. **Making a system store data in memory contiguously would:**
   (A) Results in lesser computation while searching for data
   (B) Results in more computation while searching data
   (C) Makes storing data very easy as one doesn't have to search for available memory to store
   (D) None of these
4. **Network traffic estimation is:**
   (A) Impossible (B) Easily computable via linear equations
   (C) Can only be solved using AI techniques (D) None of these
5. **The time complexity of finding a shortest path in a network is:**
   (A) Fairly low with Dijkstra's algorithm (B) Very efficient with A* search given spatial heuristics
   (C) Better than the above two using some randomization mechanism in large networks (D) None of these
6. **Which of the following is the most efficient encoding to send data via networks? Also consider the reasoning in your answer.**
   (A) 3-Excess codes because it is not weighted
   (B) Binary, because its representation can be done simply with zeros and ones
   (C) Decimal, because a decimal requires lesser space to represent the same number (D) None of these
7. **Which is better, Time slicing or time sharing?**
   (A) Time slicing is better because it deals with process allocation at the CPU level
   (B) Time sharing is better because it gives multiple users the illusion of each having his own processor
   (C) The comparison is not possible because one is part of the other (D) None of these
8. **Which type of algorithms are applicable to scheduling resources in operating systems?**
   (A) State space search (B) Machine learning (C) Bayesian learning (D) None of these
9. **Which of the following are/is true?**
   (A) In the era of platform independence all Operating systems can be made without considering low level details of machines
   (B) Operating systems can be made without using assembly languages
   (C) Operating systems aren't needed because everything can run on the internet (D) None of these
10. **In the RISC architecture, the _____ is updated whenever a function is called:**
    (A) Frame pointer and Return address registger (B) Stack pointer (C) Both (A) & (B) (D) None of these
11. **A child entity in ER diagrams is:**
    (A) The entity on the one side of a one to many relationship
    (B) Entity that inherits attributes and relations from another entity (C) A row of a table (D) None of these
12. **Boyce Codd Normal Form:**
    (A) Addresses certain type of multivalued dependencies (B) Makes sure that data in each column is atomic
    (C) Makes sure that every determinant is a candidate key (D) None of these
13. **DDL is used to:**
    (A) Represent the database structure (B) Define and manage the structure of a database
    (C) Deals with manipulation of data stored in the database (D) None of these
14. **Dynamic range in image processing is:**
    (A) Refers to span of wavelengths covered by a particular band in a multispectral image
    (B) Maximum or minimum values present in an image
    (C) Range of values spanned by grey scale (D) None of these

15. **Which of the following is true?**
    (A) Brightness gives a measure of degree to which a pure color is diluted by white light
    (B) Saturation gives a measure of degree to which a pure color is diluted by white light
    (C) Hue gives a measure of degree to which a pure color is diluted by white light (D) None of these
16. **SIFT is:**
    (A) An image deblurring algorithm (B) Basic edge detection algorithm
    (C) Used to identify and define local features (D) None of these
17. **Optical character recognition:**
    (A) Cannot be done without non deterministic algorithms
    (B) Can be done without non deterministic algorithms
    (C) Can be done more efficiently and robustly with deterministic algorithms (D) None of these
18. **Which of the following statement/s are true about PHP?**
    (A) Echo and print are same (B) Echo takes a single parameter (C) Both (A) & (B) (D) None of these
19. **Which of the following are true about the Weiner filter?**
    (A) It is a deterministic algorithm (B) It minimizes the quadratic error
    (C) It uses the binary cross entropy (D) None of these
20. **Php allows dynamic code execution using:**
    (A) Eval() (B) Reflection API (C) File Manipulation (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) Candidate must write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
(vi) Extra attempt of any question or any part of the attempted question will not be considered.

(SECTION – A)

Q. No. 2. **(a)** Why are multi-processor systems considered advantageous in computer architecture? How does parallel processing fundamentally improve the performance and scalability of a computer system? **(7)**

(b) How does the choice of architectural level impact the performance of a computer system? Provide a numerical comparison between two different architectural levels, highlighting their strengths and weaknesses. **(7)**

(c) If a processor executes 1 billion instructions per second and has an instruction execution cycle of 4 cycles per instruction. Calculate the overall execution time for a program with 1 million instructions. Discuss how reducing the number of cycles per instruction can impact performance. **(6)**

Q. No. 3. **(a)** Why cache memory is considered a critical component in a computer system? How does the internal and external data representation contribute to optimizing memory usage and system efficiency? **(7)**

(b) Explain the concept of parallelism in computer architecture. How does the internal structure of a microprocessor contribute to parallel processing capabilities? **(7)**

(c) Break down the stages of the instruction execution cycle in a computer system. How do the characteristics of CISC and RISC architectures influence the execution cycle? **(6)**

Q. No. 4. **(a)** Compare the OSI and TCP/IP models in terms of their simplicity and practicality. Why is a layered approach beneficial in network design? **(7)**

(b) Explain how overlay networks and content distribution networks enhance the performance and scalability of internet services? Provide a numerical example to illustrate their impact on content delivery. **(7)**

(c) If the internet were a city, and each device had its own unique street address, how does IP addressing work in this scenario? Explain the purpose of subnetting using a neighborhood analogy. **(6)**

Q. No. 5. **(a)** Compare the file systems of UNIX and Windows in terms of structure, permissions, and file organization. How do these file systems cater to the needs of diverse computing environments? **(7)**

(b) How does an operating system mediate between application programs and the computer hardware? Discuss the key roles and responsibilities of an operating system in managing resources. **(7)**

(c) What is process management in the context of operating systems? How does the operating system handle processes, and what role does it play in multitasking? **(6)**

(SECTION – B)

Q. No. 6. **(a)** Elaborate on the evolution of database systems, highlighting major milestones. Discuss the impact of emerging technologies on the field of database systems. **(7)**

(b) Write a SQL query involving multiple tables and incorporating JOIN operations. Discuss the potential pitfalls and optimizations related to complex SQL queries. **(7)**

(c) What are distributed databases, and why are they used? Discuss the advantages and challenges of managing data in a distributed environment. **(6)**

Q. No. 7. **(a)** Explain the algorithms used for point detection, line detection, edge detection, and boundary detection in digital images. Discuss the strengths and limitations of these techniques. **(7)**

(b) Provide detailed explanations and applications of morphological operators like erosion, dilation, opening, closing, skeletonization, and thinning in image processing. **(7)**

(c) Compare and contrast various image sensing and acquisition techniques. Discuss the advantages and limitations of different methods such as CCD and CMOS. **(6)**

Q. No. 8. **(a)** Develop a numerical comparison between client-side functionalities implemented using different JavaScript patterns. Discuss how these patterns impact code maintainability and performance? **(7)**

(b) Discuss data aspect architectures in web development. How do these architectures address challenges related to data storage, retrieval, and management? **(7)**

(c) Create a numerical comparison of the efficiency of data exchange using different APIs, such as REST and GraphQL. Discuss the considerations in choosing the appropriate API for a given scenario. **(6)**

****