FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2023 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 MARKS = 20
PART-I(MCQS): MAXIMUM 30 MINUTES	PART-II	MAXIMUM MARKS = 80

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.
(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 question will not be considered.

PART-II
SECTION-A

Q. No. 2. **(a)** Write a detailed note on any 03 Super Computing Technologies being used in the world. List key characteristics in each case. **(8)**

(b) What performance metrics are used to analyze the capacity of Super Computers? Discuss. **(6)**

(c) Discuss the role of Web Crawling, Indexing & Searching operations for a Search Engine. **(6)**

Q. No. 3. **(a)** How does dynamic memory allocation is managed programmatically in a C++ program? Clarify yours understanding through a viable program. **(8)**

(b) Write a note on the use of overloaded operators. Discuss with examples. **(6)**

(c) What is bit twiddling? Give brief description. **(6)**

Q. No. . **(a)** What is Polymorphism? Explain Ad-Hoc Polymorphism, Parametric Polymorphism & Subtyping with suitable coding examples. **(8)**

(b) Discuss Late Binding with a short program. **(6)**

(c) Differentiate between Abstraction & Encapsulation. **(6)**

SECTION-B

Q. No. 5. **(a)** For analyzing an Algorithm theoretically & asymptotically, give a detailed note on Input size, unit of time & order of growth. Support your answer with appropriate mathematical equations. **(8)**

(b) Briefly describe the four types of analysis we may perform to evaluate the asymptotic behavior of an algorithm. **(6)**

(c) Evaluate order of growth of the functions given below. Compare & write down which one has higher, same or lower order of growth than the other one: **(6)**

    I. $n(n+1)$ and $2000n^2$ II. $100n^2$ and $0.01n^3$
    III. $\text{Log}^2 n$ and $\ln n$ IV. 2^{n-1} and 2^n
    V. $(n-1)!$ and $n!$

Q. No. 6. **(a)** Discuss the architecture of aspect-oriented system. **(8)**

(b) Briefly discuss the motivation for aspect-oriented programming. **(6)**

(c) Briefly describe 05 agile software development frameworks. **(6)**

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Q. No. 7. **(a)** Design and draw a finite automaton to recognize the regular language of all strings that contain the string '001' as a substring. **(8)**

(b) Consider the following state diagram and extract the standard information, i.e., Q, Σ, q_0, F and δ. **(6)**
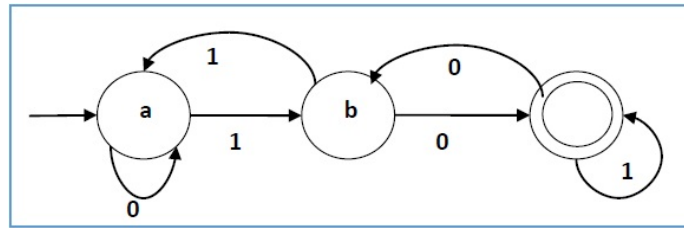
(c) How would you optimize a loop? Describe the techniques briefly. **(6)**

Q. No. 8. **(a)** Discuss the role of Syntax Tree in representing formal text structure. Develop a Syntax Tree structure for the following piece of code: **(8)**

```
while b ≠ 0
  if a > b
    a = a - b;
  else
    b = b - a;
return a;
```

(b) Describe your understanding on Constant Folding using a brief pseudo code. **(6)**

(c) What is an Optimization problem? What are its 02 general categories? Write down mathematical representation of a standard optimization problem. **(6)**

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