



**FEDERAL PUBLIC SERVICE COMMISSION**  
**COMPETITIVE EXAMINATION-2023 FOR RECRUITMENT TO**  
**POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT**  
**COMPUTER SCIENCE, PAPER-I**

Roll Number

<b>TIME ALLOWED: THREE HOURS</b>	<b>PART-I (MCQS)</b>	<b>MAXIMUM MARKS = 20</b>
<b>PART-I(MCQS): MAXIMUM 30 MINUTES</b>	<b>PART-II</b>	<b>MAXIMUM MARKS = 80</b>
<p><b>NOTE: (i) Part-II is to be attempted on the separate Answer Book.</b></p> <p><b>(ii) Attempt ONLY FOUR questions from PART-II, by selecting TWO questions from EACH SECTION. ALL questions carry EQUAL marks.</b></p> <p><b>(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.</b></p> <p><b>(iv) Write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.</b></p> <p><b>(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.</b></p> <p><b>(vi) Extra attempt of any question or any part of the question will not be considered.</b></p>		

**PART-II**  
**SECTION-A**

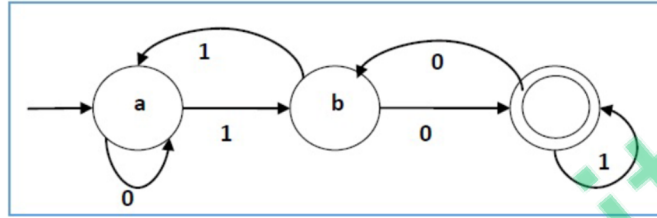
- Q. No. 2.** (a) Write a detailed note on any 03 Super Computing Technologies being used in the world. List key characteristics in each case. (8)
- (b) What performance metrics are used to analyze the capacity of Super Computers? Discuss. (6)
- (c) Discuss the role of Web Crawling, Indexing & Searching 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)

**COMPUTER SCIENCE, PAPER-I**

- 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.,  $Q$ ,  $\Sigma$ ,  $q_0$ ,  $F$  and  $\delta$ . (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)

\*\*\*\*\*