**CPP Problem Design Example**

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| **Subject: Student Records** |
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| **Main testing concept: Structures**   |  |  | | --- | --- | | **Basics** | **Functions** | | ■ C++ BASICS  ■ FLOW OF CONTROL  ■ FUNCTION BASICS  □ PARAMETERS AND OVERLOADING  ■ ARRAYS  ■ STRUCTURES AND CLASSES  □ CONSTRUCTORS AND OTHER TOOLS  □ OPERATOR OVERLOADING, FRIENDS,AND REFERENCES  ■ STRINGS  □ POINTERS AND DYNAMIC ARRAYS | □ SEPARATE COMPILATION AND NAMESPACES  □ STREAMS AND FILE I/O  □ RECURSION  □ INHERITANCE  □ POLYMORPHISM AND VIRTUAL FUNCTIONS  □ TEMPLATES  □ LINKED DATA STRUCTURES  □ EXCEPTION HANDLING  □ STANDARD TEMPLATE LIBRARY  □ PATTERNS AND UML | |
| **Description:**  Write a program that records at most 10 student data by structures. There are four functions for user to use:   1. insert (up to 10 records), (2) search, (3) delete, (4) print.   **A record of a student is defined as follow:**  typedef struct {  char firstName[25];  char lastName[30];  char phone[15];  } StRec;  **Input:**  There are four kinds of command formats (insert, delete search and print). Except the “print” command, the other three command lines contain **firstName**, **lastName** and **phone**. Use space to separate each data. The print command only needs to enter “print”.  **Format of four commands:**  (1) insert + firstName + lastName + phone  (E.g. insert Harry Potter 0987654321)  (2) delete + firstName + lastName + phone  (E.g. delete Harry Potter 0987654321)  (3) search + firstName + lastName + phone  (E.g. search Harry Potter 0987654321)  (4) print  (firstName <= 25 letters, lastName <= 30 letters, phone <= 15 numbers)  User can keep entering commands until reading EOF.  **Output:**  Users need to check for the input format accuracy, including:   1. If the length of **firstName** or **lastName** or **phone** is too long. 2. The string that inputted was not one of the four commands. 3. If **phone** is not a number. 4. Whether are there invalid characters (not a~z and A~Z) in **firstName** or **lastName.**   If input meets any of the above conditions, print “**Input Error**” and re-enter a command.  When **insert** is called, insert the record after last record. If there are already 10 records or the record already exists, print “**Insert Error**”.  When **delete** is called, find the record and delete it. If it does not exist, print “**Delete Error**”.  When **search** is called, find the record and print which index the record is in. If it does not exist, print “**Search Error**”.  When **print** is called, print all three data of records and separate them by space (e.g. Harry Potter 0987654321). If there are no records, print “**Print Error**”.  **Sample Input / Output：**   |  |  | | --- | --- | | Sample Input | Sample Output | | print  insert Elijah Smith 0912345585  print  insert Nicol Green 0901563245  insert Tom Taylor 0905615613  insert Paul Miller 0916548960  print  search Elijah Smith 0912345585  search Tom Taylor 0905615613  search Alen Lee 0953440450  delete Tom Taylor 0905615613  print  delete David King 0946549409  print  insert Obmar Wood 0965406546  print  insert Jone Smith 0916504894  insert Nicol Green 0901563245  print  insert ovuvuevuevueenyetuenwuevueugbemugbemosas Tom 0123456789012345  insert Rainy Jazz 0987a12345987654  insert Jone Six 0987580780  insert Tom Seven 0951348632  insert Jack Eight 886923654321  insert Sam Nine 00886958643215  insert TF Ten 0913648762  insert Howard Eleven 0913215468 | Print Error  Elijah Smith 0912345585  Elijah Smith 0912345585  Nicol Green 0901563245  Tom Taylor 0905615613  Paul Miller 0916548960  0  2  Search Error  Elijah Smith 0912345585  Nicol Green 0901563245  Paul Miller 0916548960  Delete Error  Elijah Smith 0912345585  Nicol Green 0901563245  Paul Miller 0916548960  Elijah Smith 0912345585  Nicol Green 0901563245  Paul Miller 0916548960  Obmar Wood 0965406546  Insert Error  Elijah Smith 0912345585  Nicol Green 0901563245  Paul Miller 0916548960  Obmar Wood 0965406546  Jone Smith 0916504894  Input Error  Input Error  Insert Error | |
| **□ Eazy,Only basic programming syntax and structure are required.**  **■ Medium,Multiple programming grammars and structures are required.**  **□ Hard,Need to use multiple program structures or complex data types.** |
| **Expected solving time:**  30 minutes |
| **Other notes:** |