Problem for R3 Batch(Enrolment Numbers BT19CSE061 to BT19CSE090):

Library management System

In an institute library, the following information are stored corresponding to each book:

1. Name of the book
2. Subject
3. Authors (surname first) of the book
4. Accsession number (an accession number is a sequential number assigned to each record or item as it is added to a library collection or database and which indicates the chronological order of its acquisition)
5. New print or reprint with year of publish
6. Issued/available

All books are stored in the database made up of ***either AVL-tree, B-tree or B+-tree***. All books of the same subject, are to be sorted according to title. All books of same title are sorted according to names of authors (if at all exists). All copies of the same book are sorted according to year of print.

One *member database* is maintained with the following information:

1. Member name
2. Department
3. Status/designation (student/faculty)
4. Member ID
5. Number of books issued

Members name are arranged according to the Department and membership no. (for members in the same department). When a new member is formed, his/her name is inserted in proper place.

To search the availability of a book in the library, the title of the book should be used as the search key (if the entire title is not known then at least two keywords of the title can be used as the search key (e.g., for *"Design and Analysis of Algorithm",* the search key may be *"Design Algorithm"*). If the title is not known properly then the name of the author can be used for searching a book. For the first case, if the book is enlisted in the library then all the corresponding information (author's name, year of print, number of copies present in the library with their availability status [issued (0), non-issued (1)]) is shown. For the second case, all books of the author will be displayed.

The issue operation displays the date of return/renew (for faculty, duration is one month and for student it is 2 weeks). A member can also check the return or renew date of all the books he/she has issued. A renewed permission can be extended upto 3 times. The maximum number of issues (i.e, number of books) for a faculty is restricted to 4 and that for students is restricted to 2 books.

A fine against late return is computed as 50 paise/day unanimously.

The insertion of a book in the library, should consider two different cases. A new print of an available book or a new book which was not available earlier in the library.

(i) Design such a library database using *suitable data structures* (***either AVL-tree, B-tree or B+-tree***). Separate *structures* should be created for faculty and student member.

(ii) Define functions for insertion of a book by considering various conditions mentioned above.

(iii) Define functions to create new faculty or student member.

(iv) Find and display the names of the faculty and the student who currently issued maximum number of books.

(v) Write a function to calculate fine against a member and display the names of the borrower having maximum fine till date.

(vi) Sort (rearrange the nodes physically, do not move the data) and display the names of the borrowers in descending order of number of borrows currently in their possession. If more than one person have same number of books borrowed then faculty name comes first. If the borrowers having same number of borrows are in the same category (both are faculties or students) then display their name in alphabetical (dictionary) order.

(vii) Create a 2-3 ordered tree (B/B+) for keep tracking the name of the defaulters who has to pay fine (e.g., members paying fine for the first time, members paying fine second time and members paying fine more than twice). Display the names who have paid fine atleast trice.