Gujarat Technological University
Master of Computer Applications Semester-I

Subject Name: **Software Project in C (SP-C)**
Subject Code: **2610007**

General Guidelines for Software Project in C (SP-C)

- Project definition should be such that it aims at providing solution to a specific requirement (problem) pertaining to preferably DMCS, FCO subjects or any other area.

- Project size in terms of Lines of Code (LOC) should be 1,000 lines or more. In case of (extensive) recursion used in medium to high complexity problem, this limit on LOC may be relaxed.

- The code should be self-documented and should follow coding standards.

- Documentation of the project should include at least description of the problem, algorithm, if any, and solution methodology.

- Project evaluation criteria are given in the last part of this annexure.

An Indicative list of C Projects

1. Write a program to demonstrate a concept. Some of the examples listed below

    a. Show how a binary number is added and subtracted using one's and two's complement
    b. Show how two ions, one positive and one negative can be combined to have a stable substance. Show how inert gas is so
    c. Show how a cell divides itself
    d. Show how a stack has an element pushed into and popped out from
    e. Show how a single adder works

2. Implement a compression algorithm and compare the result with zip and other programs. (there are many algorithms including Jpeg, Mpeg and few others, a teacher needs to specify)

3. Implement a B-tree program to provide indexed file access to a C program, or B+-tree program to provide indexed sequential file access to a C program

4. Implement a spell checker using a trie implementation

5. Implement a graphics related algorithm (for example a clipping algorithm)

6. Simulate a physics experiment (for example implement whinstone bridge)

7. Implement a program which parses a sentence typed, find out a keyword and generate an answer from the file, produces a human like interface. For example if the user types "MCA is interesting", the program parses that sentence, find out keyword 'interesting' and produces a response like "what in MCA do you find interesting?"

8. Implement a program to play tic-tac-toe (Shunya Chokdi)

9. A supermarket has more than 100 items for sale. They are divided into five major groups.

    1.   Cosmetic Items
    2.   Household items
    3.   Bakery products and beverages
    4.   Toys and Chocolates
    5.   Cigarettes and other items for men

The customer may come at any time. He is given a bag at the time of entry. He can enter into each of the above section at any time and can leave without visiting a single section as well. Whenever he chooses an item, the item is added to the bag. He can drop any item before visiting the checkout counter. No one can leave without visiting the checkout counter. At checkout counter, the customer is billed according to the prices of items in the bag.

The program is to be made for processing the customer from entry to exit. Take care of all possible scenarios that may take place in the supermarket.

10. A Railway timetable inquiry system is to be prepared. Ahemdabad Railway station contains host of trains going and coming daily. Every train has a certain schedule of stations to visit. An inquiry about a train going to a particular station must be answered from the program. Assume all possible queries related to train, schedule and timing.

11. Ahemdabad city bus network is to be programmed in such a way that from any place to any other place, if a person is interested in traveling in city bus, the program helps him/her out. Take care of providing nearby bus stands and showing solutions traveling in more than one bus when direct route is not available.

12. A teacher's timetable is to be prepared. Take all teachers data first. Store constraints with every teacher. There are two types of constraints. One type is hard constraint, which cannot be violated. Like, a lecturer cannot lecture at two places simultaneously. Soft constrains can be violated if there is no other solution exist. They are like; a lecturer should not have two lectures, one immediately after another.

13. A restaurant has 20 odd items to offer to its customers. The ingredients for all twenty items are 100. Every item has a unique set of ingredients for itself. The consumption of items varies to a large extent. That's why a safety stock for every item is decided and when the ingredient quantity is reached to a safety stock level, it is ordered. Write the program to process customer's orders and maintain inventory as well.

14. An MCA book details are to be maintained for each semester, for each subject. It should be able to provide details about all text and reference books, syllabus, the relation between a particular book and the syllabus and topic search.

15. An automobile service center has many vehicles coming daily for service and repair work. When any new accessory is needed for replacement, the center gets some amount as a concession from the manufacturer. The labor is also decided for each kind of repair work. There are two categories of customers. For one type of customers the bill is prepared as actual. For others, the concession from the manufacturer is provided to customer as well. Write a program to bill the customer based on the repair work, accessories fitted and category of customer. Consider all possible real world scenarios.

16. A manufacturing division is manufacturing various parts. Root parts are atomic parts, which are not made up of any other parts. Finished parts are final parts, which are not used to construct any other parts. Apart from that, every other part is in turn is made up of several other parts. Write a program to read details about each part. Provide ways to answer questions like 1. Listing parts which constitutes a given part 2. List all parts in which a given part is used as an assembly 3. Listing of all root or finished parts.

Additional Indicative Projects

Find roots of Non-Linear Equations using the below methods: (150 lines of code)
1. Bisection method
2. False Position method
3. Secant method
4. Newton Raphson method
5. Successive Approximation method
6. Birge Vieta method

Develop C Program for the following methods (200 lines of code)
1. Lagrange Interpolation
2. Newton's forward difference interpolation
3. Newton's backward difference interpolation
4. Newton's divided difference interpolation
5. Inverse Interpolation

Approximation using the following methods (180 lines of code)
1. Fitting a straight line
2. Fitting an exponential curve
3. Approximation by Taylor series

Solve Numerical Differentiation and Integration Problems using following methods
1. Differentiating a function
2. Trapezoidal Rule
3. Simpson's 1/3 Rule
4. Simpson's 3/8 Rule
5. Gauss Quadrature Integration

Perform the below mentioned matrix operations/methods (180 lines of code)
1. Inverse of a matrix
2. Gauss Elimination method
3. Gauss Seidel method
4. Power method

Find the solution of the ordinary differential equations using the below mentioned methods (260 lines of code)

1. Taylor series
2. Runge-Kutta 2nd order
3. Runge-Kutta 3rd order
4. Runge-Kutta 4th order
5. Milne Simpson's Predictor Corrector method
6. **Adam's Moulton Predictor Corrector method**

Reference Books:

1. Ashok M. Kamthane, "Programming in C", Pearson (2006) ISBN: 978-81-317-6031-4
2. ISRD Group, "Programming and Problem Solving Using C", Tata McGraw-Hill (2010), ISBN: 978-0-07-066760-0

Criteria for Evaluation of Software Projects in C

- Project Definition, Its Size, Complexity, and Quantum of Work: **15%**
- Coding Style including (i) Generalized-Parameterized, (ii) Structured-Modular Coding Style, (iii) Compactness & Clarity, (iv) Checkpoints for intermediate results, (v) Naming Conventions, (vi) Self-Documented: **30%**
- Completion and Operational: **25%**
- Quality of Output and Testing Plan, etc: **10%**
- A Section in Report Containing: Analysis of Various Alternatives and the Justification for the Selected Approach: **10%**
- Overall: **10%**