

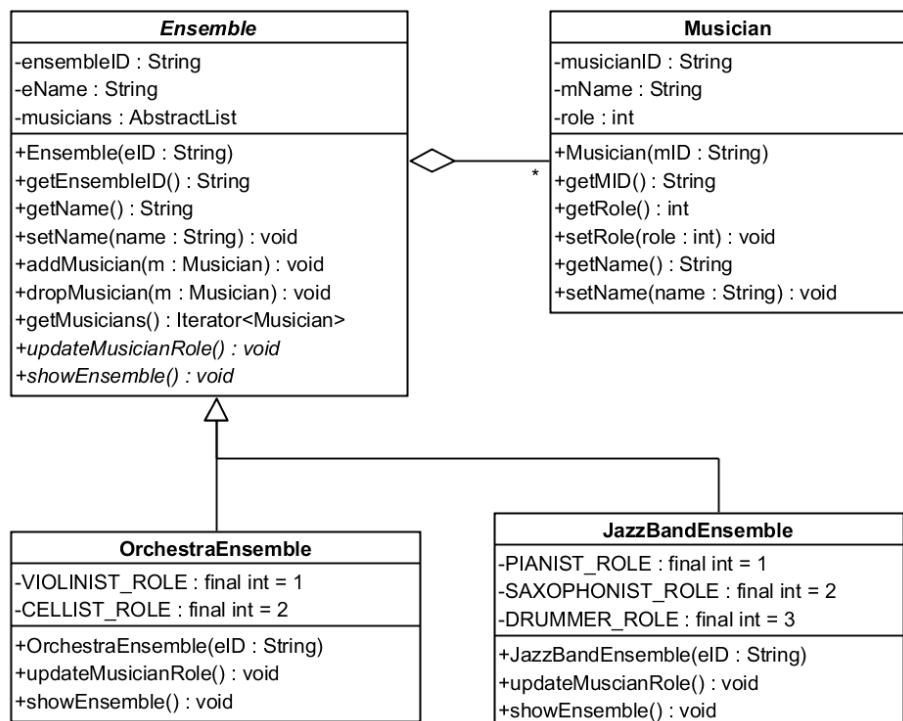
Hong Kong Institute of Information Technology
HIGHER DIPLOMA IN SOFTWARE ENGINEERING (IT114105)

Module Name:	Contemporary Topics in Software Engineering
Module Code:	ITP4507
Assignment Number:	One
Hand-in:	Friday 14 November, 2025 (On or before 4:30 PM to Moodle)
Weighting of This Assignment:	66.67% of the End of Module Assessment

This assignment must be done by individual only. Plagiarism will be treated seriously. Any assignments that are found involved wholly or partly in plagiarism (no matter the assignments are from the original authors or from the plagiarists) will score Zero mark. **Late submission will NOT be accepted.**

Task Specification

The Modern Music Management Company offers online services for managing music ensembles. It oversees a range of music ensembles and details about musicians globally. The company plans to develop a Musical Ensemble Management System (MEMS) to maintain the musicians in ensembles for different kinds of musical groups. At present, the system accommodates orchestra and jazz band, with plans for **expansion to include more ensemble varieties** in future. Below is the simplified class diagram representing the current data structure in MEMS.



Be noted that **Ensemble** is an abstract class (so as its abstract functions: `updateMusicianRole()`, `showEnsemble()`), you may use `Vector` or `LinkedList` for `AbstractList` in **Ensemble**.

As a system analyst of the Company, you are required to design and develop MEMS. You are reminded **not to change** the design of the existing classes: Ensemble, OrchestraEnsemble, JazzBandEnsemble, and Musician.

MEMS should provide the following functions:

1. Create an Ensemble record.
2. Set the current ensemble by Ensemble ID.
3. Add a musician to the current ensemble
4. Modify the instrument of a musician of the current ensemble
5. Delete a musician from the current ensemble
6. Show the current ensemble
7. Display all ensembles
8. Change the name of the current ensemble
9. Undo last command
10. Redo the last undone command
11. Show undo/redo list
12. Exit System

Your system design should conform to the Open Closed Principle so that your design should easily be extended to support new music groups (for examples, rock band, reggae band, etc..).

You **MUST** apply the following design patterns for your new system

- **Command pattern** to provide the “create ensemble”, “set current ensemble”, “add musician”, “modify musician’s instrument”, “delete musician”, “show current ensemble”, “display all ensembles”, “change ensemble’s name”. “undo”, “redo” and “show undo/redo list” functions
- **Factory pattern or Abstract Factory Pattern** to create different kinds of ***Command objects*** and different kinds of ***Ensemble/Musician objects*** (e.g., JazzBandEnsemble object, OrchestraEnsemble object, Musician object, etc.)
- **Memento pattern** to provide “Undo” and “Redo” functions on the modify musician’s instrument” and “change ensemble’s name” functions.

Assignment Report

In addition to the system development, you are required to write up a **Short Report** covers the following sections:

- 1. Assumptions regarding the problem context**
- 2. Application design with class diagram**
- 3. Discussion and explanation on each of the design patterns applied to the application**
- 4. Test Plan and Test Cases**
- 5. Well documented Source Code**

Mark Allocation

Your assignment work will be marked according to the following criteria.

Work	Mark Allocated
System Coding and Implementation	
a) Implementation of the system and coding style (Hard-coded output will result in zero mark.)	30%
b) Correctness of system functions * (Hard-coded output will result in zero mark.)	15%
c) Test Plan and Test Cases (Will be used in testing your own application.)	10%
System Analysis and Design, and Discussion	
d) Design of your system and correct use of design patterns	20%
e) Application design with class diagram	10%
f) Discussion and explanation on each of the design patterns applied to the application	15%
Total	100%

Note: * Please note that your source code will be recompiled and tested for the correctness of the system functions. You need to provide Windows batch file run.bat for compiling and running your system. For example, the run.bat file may contain the following commands for compiling Java source code and running your system:

```
javac *.java
```

```
java Main
```

Submission of Assignment Work

1. The front page of your submission should include the **programme title(code)**, **module title(code)**, and **student number and student name**.
2. Submit your Java source code and your report to <https://moodle.vtc.edu.hk>.
 - Well documented Source Code of your program and Windows batch file run.bat for compiling and running your system.
 - Report for analysis, design, discussion, user guide, test plan and test cases of your following work.
 - A. The assumption made during analysis and design of the application
 - B. System design on your application with class diagram
 - C. Discussion on the design patterns that applied on your program
 - D. Test Plan with Test Cases (Design your own test plan and corresponding test cases for each function. For each test case, you should provide a SCREEN CAPTURE for test result).
3. Submit according to the guideline on the top part of cover page. **Late submission will NOT be accepted.**

Extra Reference: Sample Test

Testing Method

This sample run is served for reference only. You are free to design your own user interface. However, the input commands cannot be changed.

Sample Run of assignment

You may follow the design of user interface shown in this sample run in DOS command prompt.

For following examples, character(s) with bold and red is user's input.

1. Create ensemble an orchestra

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **c**

Enter music type (o = orchestra | j = jazz band) :- **o**

Ensemble ID:- **E001**

Ensemble Name:- **SYO**

Orchestra ensemble is created.

Current ensemble is changed to E001.

2. Add musicians to the orchestra ensemble

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **a**

Please input musician information (id, name):- **m001, Chole Chua**

Instrument (1 = violinist | 2 = cellist):- **1**

Musician is added.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **a**

Please input musician information (id, name):- **m002, Mischa Maisky**

Instrument (1 = violinist | 2 = cellist):- **2**

Musician is added.

3. Show the current ensemble

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **se**

Orchestra Ensemble SYO (E001)

Violinist:

m001, Chole Chua

Cellist:

m002, Mischa Maisky

4. Create ensemble a jazz band and display all ensembles

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **c**

Enter music type (o = orchestra | j = jazz band) :- **j**

Ensemble ID:- **E102**

Ensemble Name:- **BLUE NOTE**

Jazz band ensemble is created.

Current ensemble is changed to E102.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **sa**

Orchestra Ensemble SYO (E001)

Jazz Band Ensemble BLUE NOTE (E102)

5. Add musicians to the jazz band ensemble

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **a**

Please input musician information (id, name):- **m101, Herbie Hancock**

Instrument (1 = pianist | 2 = saxophonist | 3 = drummer):- **1**

Musician is added.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **a**

Please input musician information (id, name):- **m102, John Coltrane**

Instrument (1 = pianist | 2 = saxophonist | 3 = drummer):- **2**

Musician is added.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x]:- **a**

Please input musician information (id, name):- **m103, Buddy Rich**

Instrument (1 = pianist | 2 = saxophonist | 3 = drummer):- **3**

Musician is added.

6. Show the current ensemble

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x]:- **se**

Jazz Band Ensemble BLUE NOTE (E102)

Pianist:

m101, Herbie Hancock

Saxophonist:

m102, John Coltrane

Drummer:

m103, Buddy Rich

7. Set the current ensemble by Ensemble ID

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x]:- **s**

Please input ensemble ID:- **E001**

Changed current ensemble to E001.

8. Display all ensembles

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **sa**

Orchestra Ensemble SYO (E001)

Jazz Band Ensemble BLUE NOTE (E102)

9. Add musician

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **a**

Please input musician information (id, name):- **m003, Joshua Bell**

Instrument (1 = violinist | 2 = cellist):- **1**

Musician is added.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **se**

Orchestra Ensemble SYO (E001)

Violinist:

m001, Chole Chua

m003, Joshua Bell

Cellist:

m002, Mischa Maisky

10. Modify musician's instrument

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **m**

Please input musician ID:- **m001**

Instrument (1 = violinist | 2 = cellist):- **2**

Instrument is updated.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **se**

Orchestra Ensemble SYO (E001)

Violinist:

m003, Joshua Bell

Cellist:

m001, Chole Chua

m002, Mischa Maisky

11. Delete musician

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **d**

Please input musician ID:- **m001**

Musician is deleted.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **se**

Orchestra Ensemble SYO (E001)

Violinist:

m003, Joshua Bell

Cellist:

m002, Mischa Maisky

12. Change the name of the current ensemble

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **cn**

Please input new name of the current ensemble:- **HSO**

Ensemble's name is updated.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 HSO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **se**

Orchestra Ensemble HSO (E001)

Violinist:

m003, Joshua Bell

Cellist:

m002, Mischa Maisky

13. Show undo/redo list

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- |

Undo List

Create orchestra ensemble, E001, SYO

Add musician, m001, Chole Chua, violinist

Add musician, m002, Mischa Maisky, cellist

Create jazz band ensemble, E102, BLUE NOTE

Add musician, m101, Herbie Hancock, pianist

Add musician, m102, John Coltrane, saxophonist

Add musician, m103, Buddy Rich, drummer

Add musician, m003, Joshua Bell, violinist

Modify musician's instrument, m001, cellist

Delete musician, m001

Change ensemble's name, E001, HSO

-- End of undo list --

Redo List

-- End of redo list --

14. UNDO actions in UNDO list

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- |

Command (Change ensemble's name, E001, HSO) is undone.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
 u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **se**

Orchestra Ensemble SYO (E001)

Violinist:

m003, Joshua Bell

Cellist:

m002, Mischa Maisky

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
 d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
 u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **u**

Command (Delete musician, m001) is undone.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
 d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
 u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **se**

Orchestra Ensemble SYO (E001)

Violinist:

m003, Joshua Bell

Cellist:

m001, Chole Chua

m002, Mischa Maisky

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
 u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x]:- **u**

Command (Modify musician's instrument, m001, cellist) is undone.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
 d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
 u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x]:- **se**

Orchestra Ensemble SYO (E001)

Violinist:

m001, Chole Chua

m003, Joshua Bell

Cellist:

m002, Mischa Maisky

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
 d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
 u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x]:- **u**

Command (Add musician, m003, Joshua Bell, violinist) is undone.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
 d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
 u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x]:- **u**

Command (Add musician, m103, Buddy Rich, drummer) is undone.

The current ensemble is changed to E102 BLUE NOTE.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x]:- **se**

Jazz Band Ensemble BLUE NOTE (E102)

Pianist:

m101, Herbie Hancock

Saxophonist:

m102, John Coltrane

Drummer:

NIL

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x]:- **u**

Command (Add musician, m102, John Coltrane, saxophonist) is undone.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x]:- **u**

Command (Add musician, m101, Herbie Hancock, pianist) is undone.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **u**

Command (Create jazz band ensemble, E102, BLUE NOTE) is undone.

The current ensemble is changed to E001 SYO.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **s**

Please input ensemble ID:- **E102**

Ensemble E102 is not found!!

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,
d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,
u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **l**

Undo List

Create orchestra ensemble, E001, SYO

Add musician, m001, Chole Chua, violinist

Add musician, m002, Mischa Maisky, cellist

-- End of undo list --

Redo List

Change ensemble's name, E001, HSO

Delete musician, m001

Modify musician's instrument, m001, cellist

Add musician, m003, Joshua Bell, violinist

Add musician, m103, Buddy Rich, drummer

Add musician, m102, John Coltrane, saxophonist

Add musician, m101, Herbie Hancock, pianist

Create jazz band ensemble, E102, BLUE NOTE

-- End of redo list –

15. REDO actions in REDO list

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E001 SYO.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **r**

Command (Create jazz band ensemble, E102, BLUE NOTE) is redone.

The current ensemble is changed to E102.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **r**

Command (Add musician, m101, Herbie Hancock, pianist) is redone.

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x] :- **se**

Jazz Band Ensemble BLUE NOTE (E102)

Pianist:

m101, Herbie Hancock

Saxophonist:

NIL

Drummer:

NIL

Music Ensembles Management System (MEMS)

c = create ensemble, s = set current ensemble, a = add musician, m = modify musician's instrument,

d = delete musician, se = show ensemble, sa = display all ensembles, cn = change ensemble's name,

u = undo, r = redo, l = list undo/redo, x = exit system

The current ensemble is E102 BLUE NOTE.

Please enter command [c | s | a | m | d | se | sa | cn | u | r | l | x]:- |

Undo List

Create orchestra ensemble, E001, SYO

Add musician, m001, Chole Chua, violinist

Add musician, m002, Mischa Maisky, cellist

Create jazz band ensemble, E102, BLUE NOTE

Add musician, m101, Herbie Hancock, pianist

-- End of undo list --

Redo List

Change ensemble's name, E001, HSO

Delete musician, m001

Modify musician's instrument, m001, cellist

Add musician, m003, Joshua Bell, violinist

Add musician, m103, Buddy Rich, drummer

Add musician, m102, John Coltrane, saxophonist

-- End of redo list --

- END OF SAMPLE TEST -