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ITMD – 513 Open Source Programming

Summer 2013 – MP2

This mini-project is to understand the basics of Python and get aware of its strengths.

The following concepts of Python are better understood through this project:

- Concept of Queues
- Classes and Objects
- Usage of Queues.PriorityQueue
- Tuples
- Dictionary
- Lists

The project is basically to inculcate a strong foundation in Object Oriented Programming using Python

System Requirement

- OS – Windows 7
- IDE – Eclipse
- Python 2.7 (for MP2a, MP2b)
- Python 3.0 (for MP2c)

Insights

MP2a.py

This script is developed to implement priority queues.

The priority queue is defined as `PQ = [D0, D1, D2, D3, D4, D5, D6, D7, D8, D9 ]`

Each of the dictionaries D0 through D9 consist of key value pairs,

Where,

Key = priority

Value = list of dictionaries each of which have are of the form {datetime : task description}

Few assumptions made and the insights:

- Code was developed before the hint was shared and hence has a slightly different logic

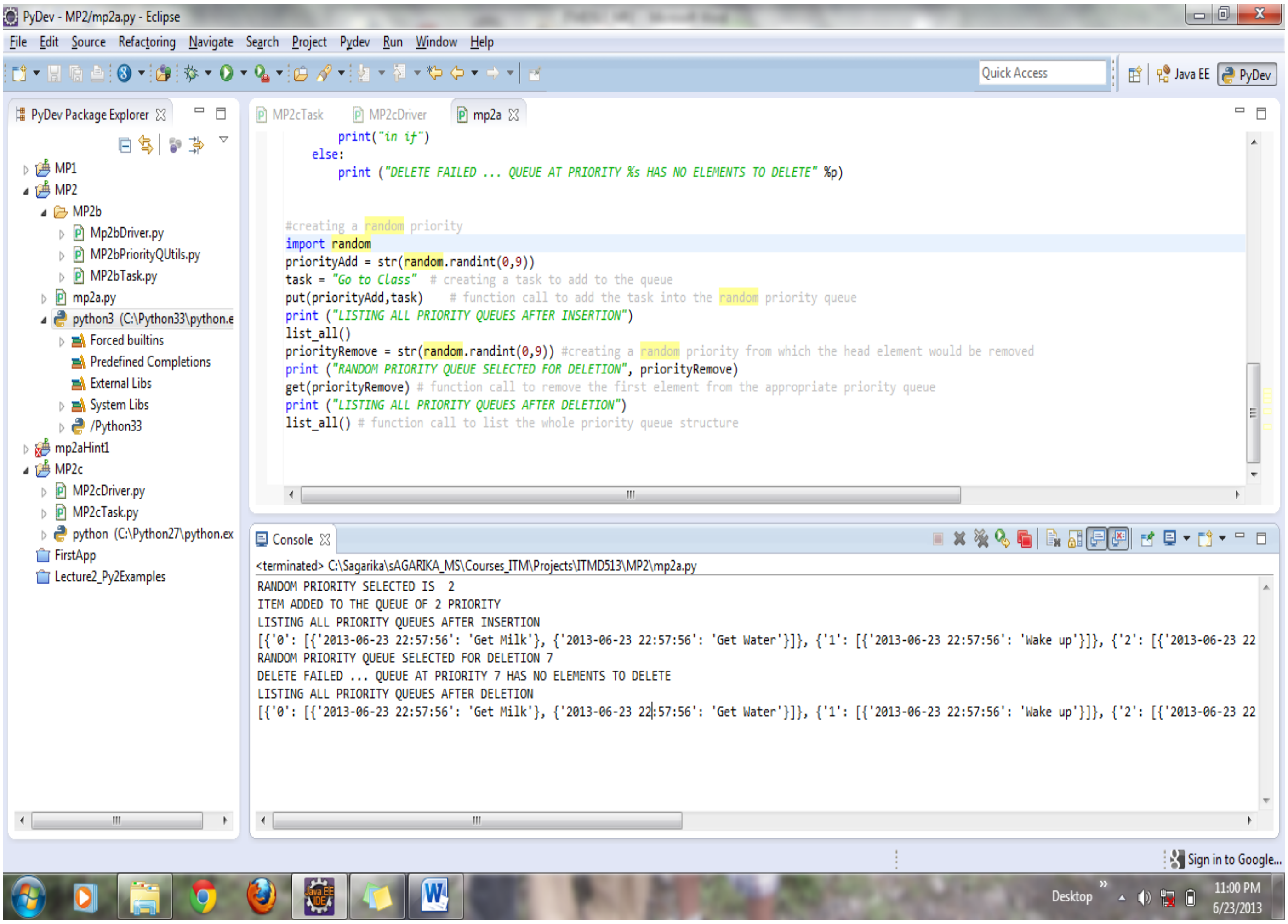
- Put() : A random priority is selected and a task description is created.
  This priority is the key within PQ
  And the value = [{currentTimeStamp : taskDescription}]
- List_all() : The entire PQ is displayed
- Get() : The first element of the dictionary corresponding to the chosen priority is popped out.
- Simulation of the above methods is shown
- A random priority (0-9) selected for inserting (put) into the PQ and deleting (get) from PQ

Expected Result

- Prints the random priority selected for Insert
- Lists the whole PQ after insertion
- Prints the random priority selected for delete
- Delete fails if no elements are present at the priority selected.
  (or) The first element is deleted from the list of elements at the selected priority

TestCases

Output depicting the whole run



```
            print("in if")
        else:
            print ("DELETE FAILED ... QUEUE AT PRIORITY %s HAS NO ELEMENTS TO DELETE" %p)


#creating a random priority
import random
priorityAdd = str(random.randint(0,9))
task = "Go to Class"  # creating a task to add to the queue
put(priorityAdd,task)    # function call to add the task into the random priority queue
print ("LISTING ALL PRIORITY QUEUES AFTER INSERTION")
list_all()
priorityRemove = str(random.randint(0,9)) #creating a random priority from which the head element would be removed
print ("RANDOM PRIORITY QUEUE SELECTED FOR DELETION", priorityRemove)
get(priorityRemove) # function call to remove the first element from the appropriate priority queue
print ("LISTING ALL PRIORITY QUEUES AFTER DELETION")
list_all() # function call to list the whole priority queue structure
```

```
<terminated> C:\Sagarika\sAGARIKA_MS\Courses_ITM\Projects\ITMD513\MP2\mp2a.py
RANDOM PRIORITY SELECTED IS  2
ITEM ADDED TO THE QUEUE OF 2 PRIORITY
LISTING ALL PRIORITY QUEUES AFTER INSERTION
[{'0': [{'2013-06-23 22:57:56': 'Get Milk'}, {'2013-06-23 22:57:56': 'Get Water'}]}, {'1': [{'2013-06-23 22:57:56': 'Wake up'}]}, {'2': [{'2013-06-23 22
RANDOM PRIORITY QUEUE SELECTED FOR DELETION 7
DELETE FAILED ... QUEUE AT PRIORITY 7 HAS NO ELEMENTS TO DELETE
LISTING ALL PRIORITY QUEUES AFTER DELETION
[{'0': [{'2013-06-23 22:57:56': 'Get Milk'}, {'2013-06-23 22:57:56': 'Get Water'}]}, {'1': [{'2013-06-23 22:57:56': 'Wake up'}]}, {'2': [{'2013-06-23 22
```

MP2b

PQ is the Priority Queue with each of its indexes denoting its priority value

User is presented with the options to

- Insert – put
- Retrieve – get
- Dump – list_all
- Stop - exit

Insights

- **Driver** – This is the main file to be executed in the project
  - It takes the user input for any operation to be performed
  - Get – retrieves the first element from the list of objects at the priority selected
  - Put – inserts the task object of the kind (id,timestamp,task_descption) at the priority level given by the user
    where, ID – is the unique value generated by the code
    timestamp – is the current day time
    task_descption – is the task description given by the user
  - Dump – displays all the elements in the PQ at every priority level

Code Structure

Files:

1. **MP2bDriver**

   This is the driver of the project

   Takes user input for selection of operation.

   Calls the appropriate function for operation from **MP2bPriorityQUtils**

   Uses the Class **MP2bTask** for creating the task objects

2. **MP2bPriorityQUtils**

   This has all the utility functions for the queue operations
   Get() , put(), dump () as described above

3. **MP2bTask**

   This is the class file for Task Objects.

   It consists of set(), get() and display operations for the task objects.

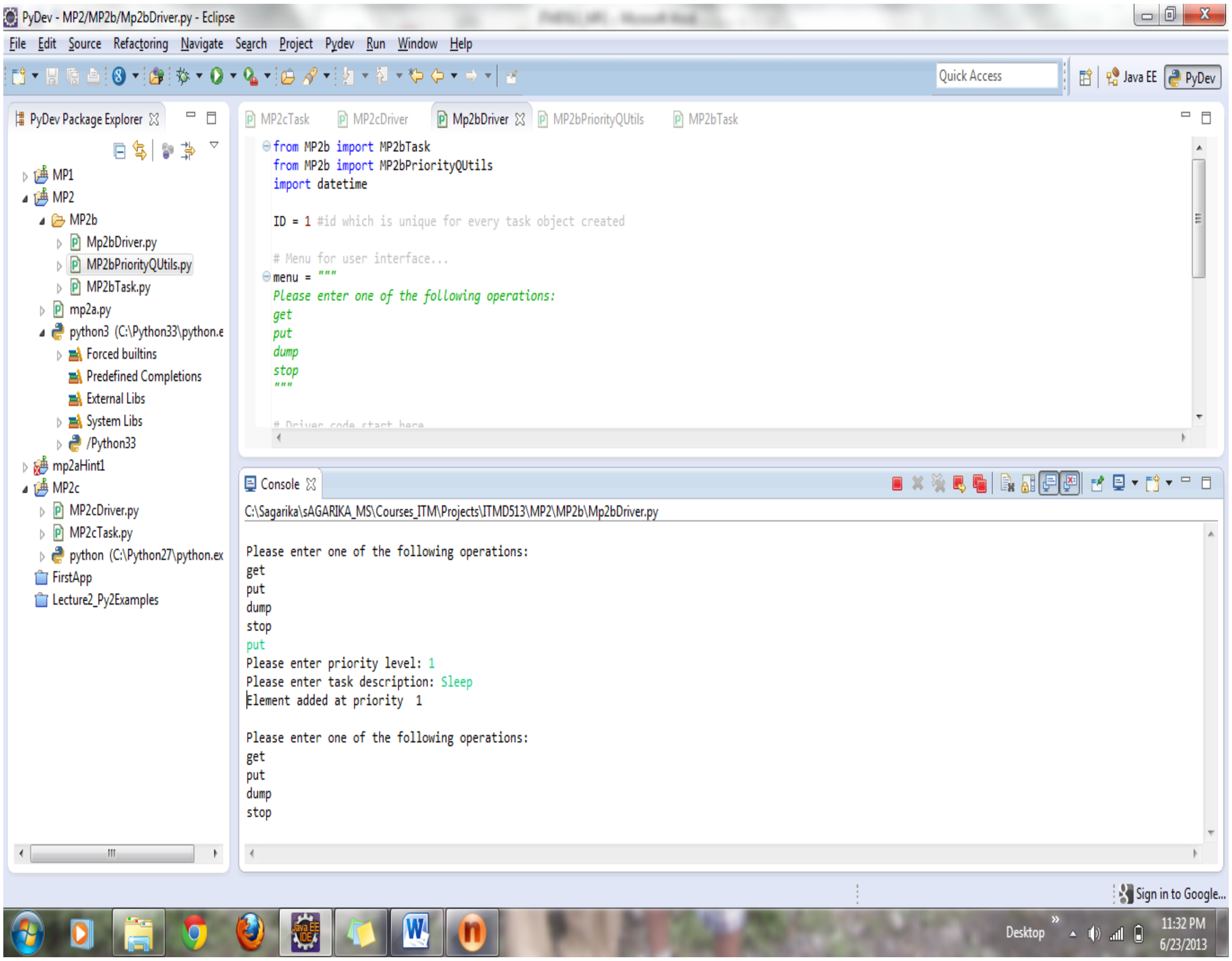
Set () – to set the values of task's id, timestamp, description

Get () – to return the current task

Display () – to display the task attributes

Expected Results

- User is presented with a menu screen
- When user inputs 'put'
    - User is prompted for priority and description
    - The new element is inserted at the priority selected by user with a unique task_id, current_time_stamp, task_decription

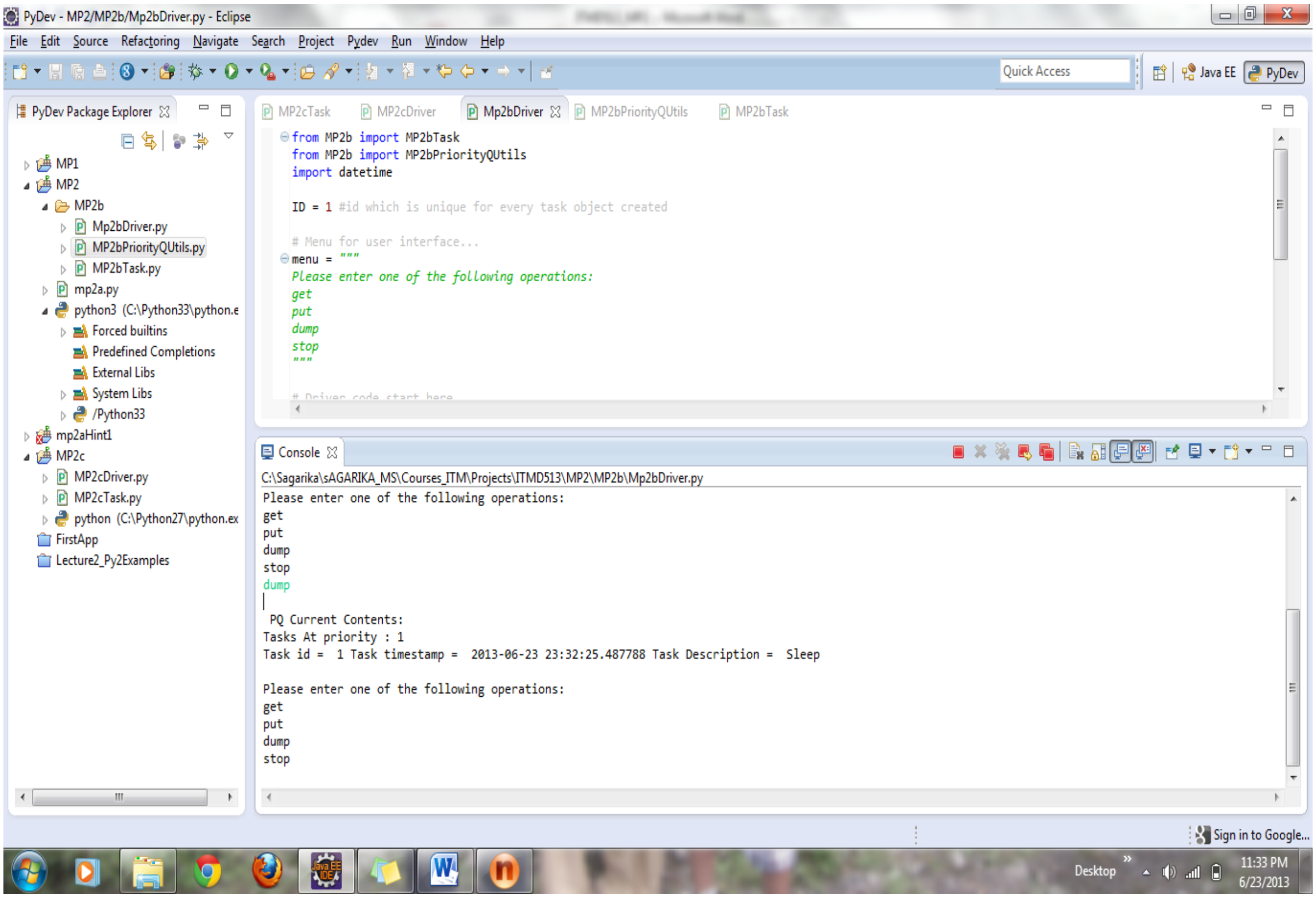


```
from MP2b import MP2bTask
from MP2b import MP2bPriorityQUtils
import datetime

ID = 1 #id which is unique for every task object created

# Menu for user interface...
menu = """
Please enter one of the following operations:
get
put
dump
stop
"""

# Driver code start here
```

C:\Sagarika\sAGARIKA_MS\Courses_ITM\Projects\ITMD513\MP2\MP2b\Mp2bDriver.py

```
Please enter one of the following operations:
get
put
dump
stop
put
Please enter priority level: 1
Please enter task description: Sleep
Element added at priority  1

Please enter one of the following operations:
get
put
dump
stop
```

- **Dump** – Contents of the priority queue are displayed

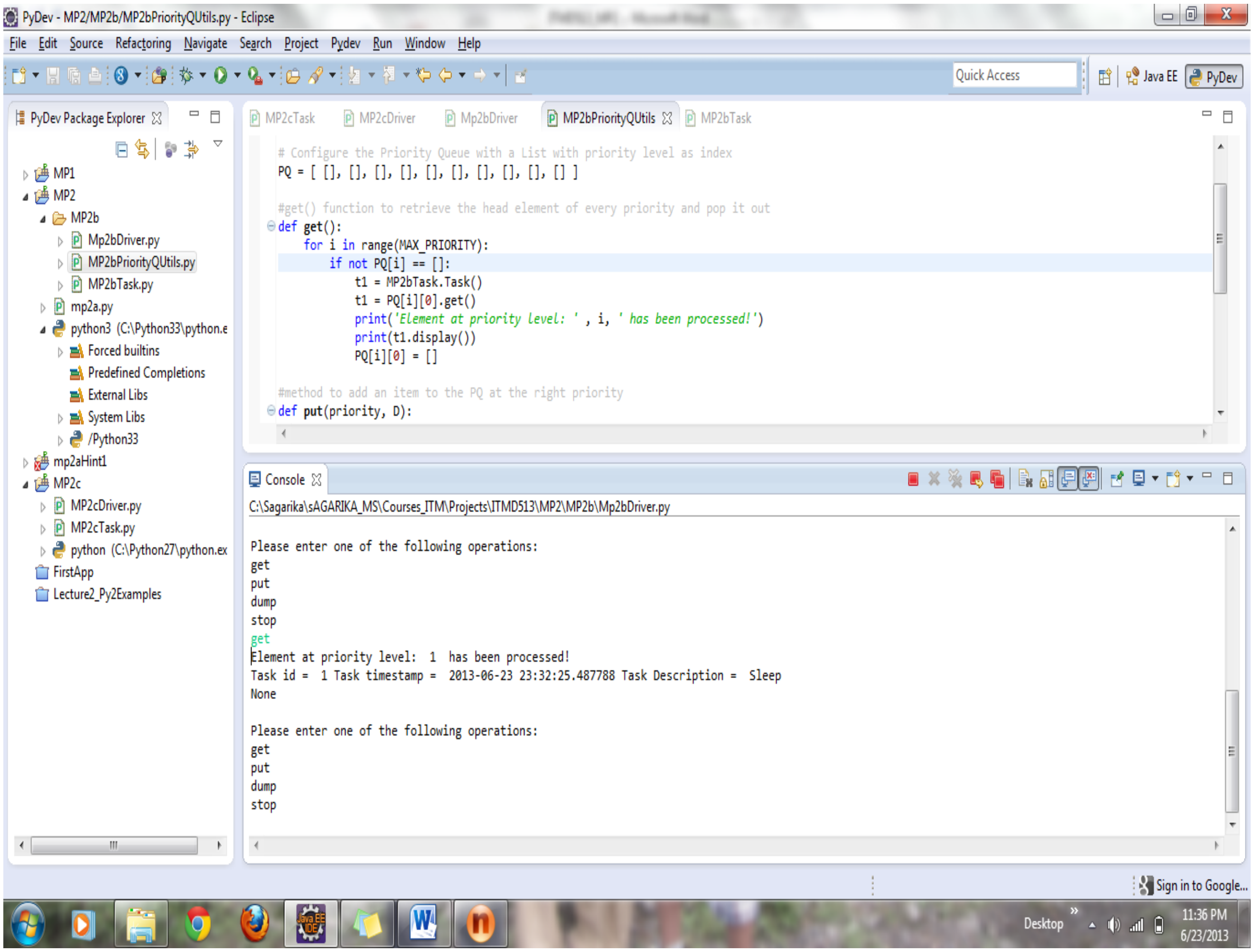


```
from MP2b import MP2bTask
from MP2b import MP2bPriorityQUtils
import datetime

ID = 1 #id which is unique for every task object created

# Menu for user interface...
menu = """
Please enter one of the following operations:
get
put
dump
stop
"""


# Driver code start here
```

```
C:\Sagarika\sAGARIKA_MS\Courses_ITM\Projects\ITMD513\MP2\MP2b\Mp2bDriver.py
Please enter one of the following operations:
get
put
dump
stop
dump

 PQ Current Contents:
Tasks At priority : 1
Task id =  1 Task timestamp =  2013-06-23 23:32:25.487788 Task Description =  Sleep

Please enter one of the following operations:
get
put
dump
stop
```

- **Get()**

First element from all priority positions are removed



```
# Configure the Priority Queue with a List with priority level as index
PQ = [ [], [], [], [], [], [], [], [], [], [] ]

#get() function to retrieve the head element of every priority and pop it out
def get():
    for i in range(MAX_PRIORITY):
        if not PQ[i] == []:
            t1 = MP2bTask.Task()
            t1 = PQ[i][0].get()
            print('Element at priority level: ' , i, ' has been processed!')
            print(t1.display())
            PQ[i][0] = []

#method to add an item to the PQ at the right priority
def put(priority, D):
```

C:\Sagarika\sAGARIKA_MS\Courses_ITM\Projects\ITMD513\MP2\MP2b\Mp2bDriver.py

```

Please enter one of the following operations:
get
put
dump
stop
get
Element at priority level:  1  has been processed!
Task id =  1 Task timestamp =  2013-06-23 23:32:25.487788 Task Description =  Sleep
None

Please enter one of the following operations:
get
put
dump
stop
```

- **Stop()**
  Exits from the loop of user interface

MP2c

PQ is the Priority Queue with each of its indexes denoting its priority value

User is presented with the options to

- Insert – put
- Retrieve – get
- Dump – list_all
- Stop - exit

Insights

- **Driver** – This is the main file to be executed in the project
    - It takes the user input for any operation to be performed
    - Get – retrieves the first element from the priority queue (smallest priority element)
    - Put – inserts the task object of the kind (timestamp,task_description) at the priority level given by the user
      where,
      timestamp – is the current day time
      task_description – is the task description given by the user
    - Dump – displays all the elements in the PQ

Code Structure

Files:

MP2cDriver

This is the driver of the project

Takes user input for selection of operation.

Uses the Class **MP2cTask** for creating the task objects

MP2cTask

This is the class file for Task Objects.

It consists of set(), get() and display operations for the task objects.

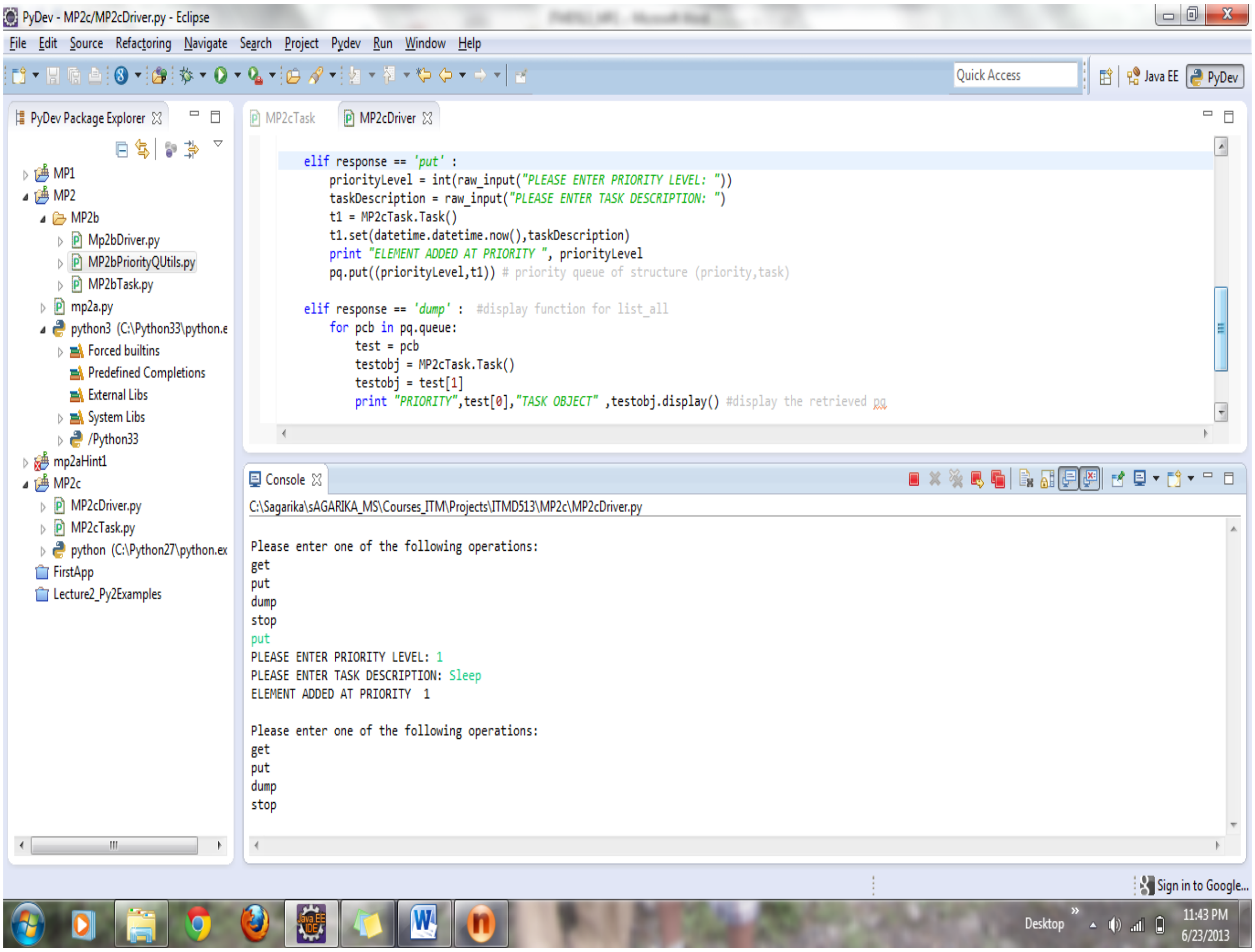
Set () – to set the values of task's timestamp, description

Get () – to return the current task

Display () – to display the task attributes

Expected Results

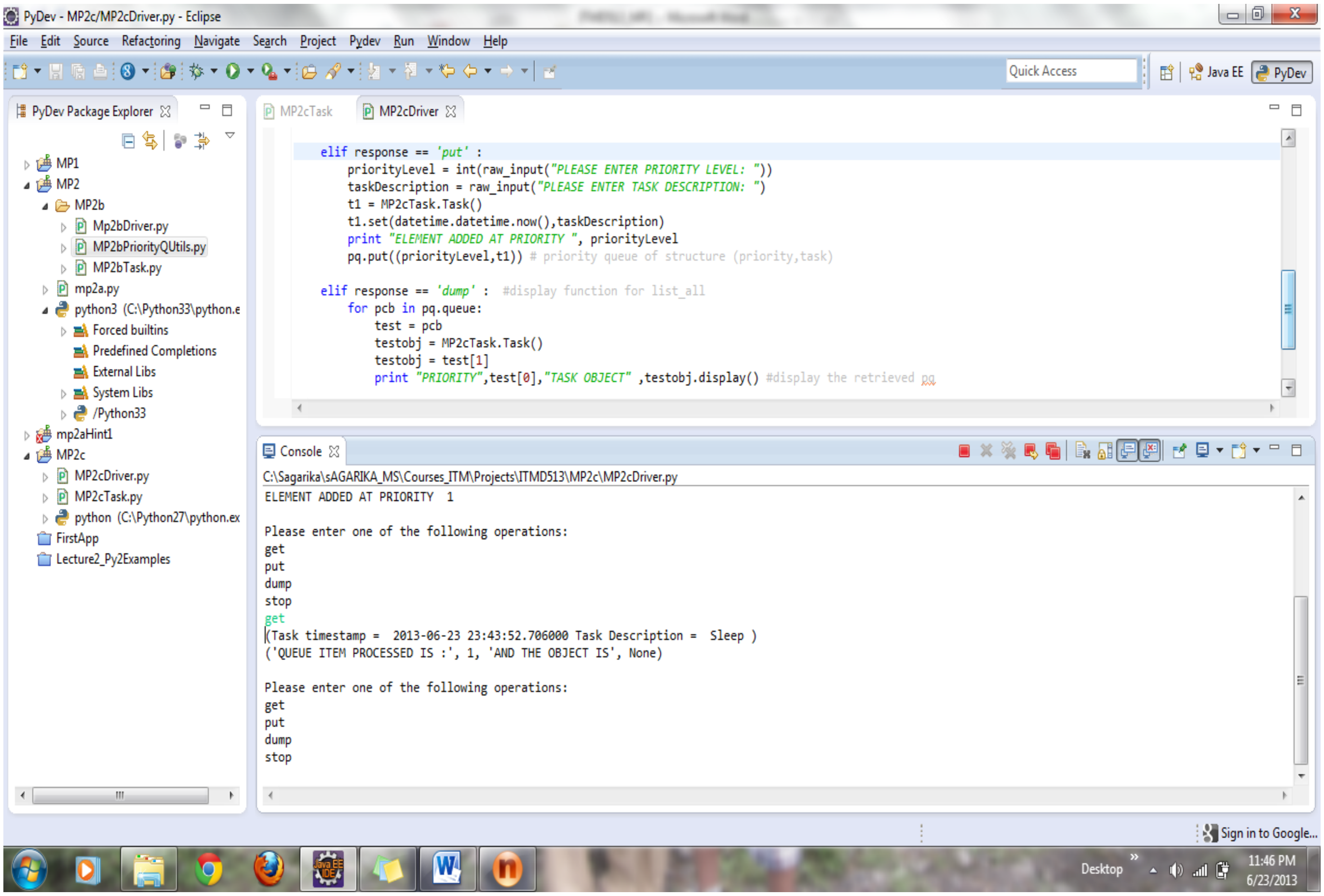
- User is presented with a menu screen
- When user inputs ‘put’
    - User is prompted for priority and description
    - The new element is inserted at the priority selected by user with a (priority,(current_time_stamp, task_decription))



```python
    elif response == 'put' :
        priorityLevel = int(raw_input("PLEASE ENTER PRIORITY LEVEL: "))
        taskDescription = raw_input("PLEASE ENTER TASK DESCRIPTION: ")
        t1 = MP2cTask.Task()
        t1.set(datetime.datetime.now(),taskDescription)
        print "ELEMENT ADDED AT PRIORITY ", priorityLevel
        pq.put((priorityLevel,t1)) # priority queue of structure (priority,task)

    elif response == 'dump' :  #display function for list_all
        for pcb in pq.queue:
            test = pcb
            testobj = MP2cTask.Task()
            testobj = test[1]
            print "PRIORITY",test[0],"TASK OBJECT" ,testobj.display() #display the retrieved pq
```

```
C:\Sagarika\sAGARIKA_MS\Courses_ITM\Projects\ITMD513\MP2c\MP2cDriver.py

Please enter one of the following operations:
get
put
dump
stop
put
PLEASE ENTER PRIORITY LEVEL: 1
PLEASE ENTER TASK DESCRIPTION: Sleep
ELEMENT ADDED AT PRIORITY  1

Please enter one of the following operations:
get
put
dump
stop
```

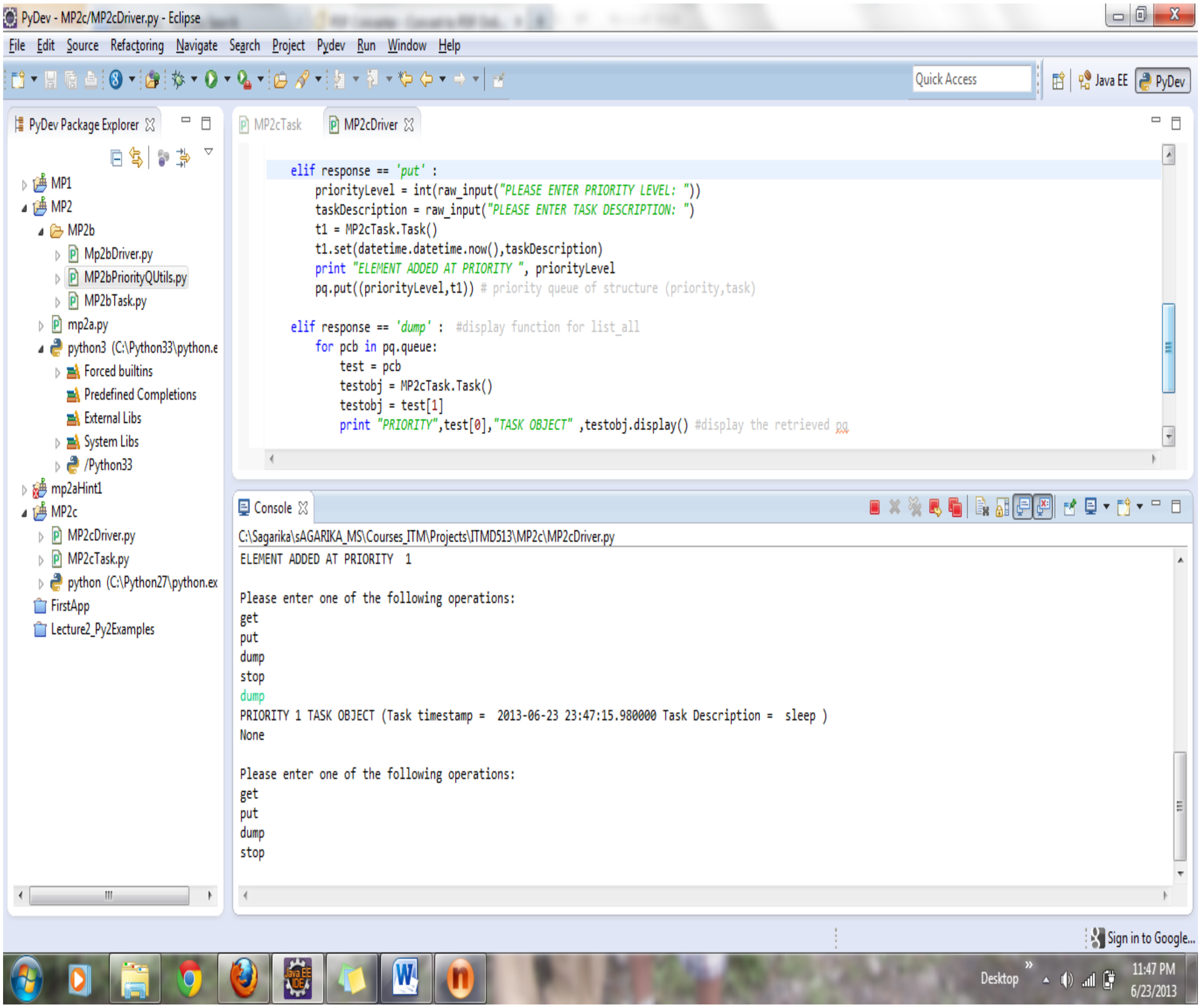
- Get () – when user enters get, the element of the lowest priority is retrieved



```
    elif response == 'put' :
        priorityLevel = int(raw_input("PLEASE ENTER PRIORITY LEVEL: "))
        taskDescription = raw_input("PLEASE ENTER TASK DESCRIPTION: ")
        t1 = MP2cTask.Task()
        t1.set(datetime.datetime.now(),taskDescription)
        print "ELEMENT ADDED AT PRIORITY ", priorityLevel
        pq.put((priorityLevel,t1)) # priority queue of structure (priority,task)

    elif response == 'dump' :  #display function for list_all
        for pcb in pq.queue:
            test = pcb
            testobj = MP2cTask.Task()
            testobj = test[1]
            print "PRIORITY",test[0],"TASK OBJECT" ,testobj.display() #display the retrieved pq
```

```
C:\Sagarika\sAGARIKA_MS\Courses_ITM\Projects\ITMD513\MP2c\MP2cDriver.py
ELEMENT ADDED AT PRIORITY  1

Please enter one of the following operations:
get
put
dump
stop
get
(Task timestamp =  2013-06-23 23:43:52.706000 Task Description =  Sleep )
('QUEUE ITEM PROCESSED IS :', 1, 'AND THE OBJECT IS', None)

Please enter one of the following operations:
get
put
dump
stop
```

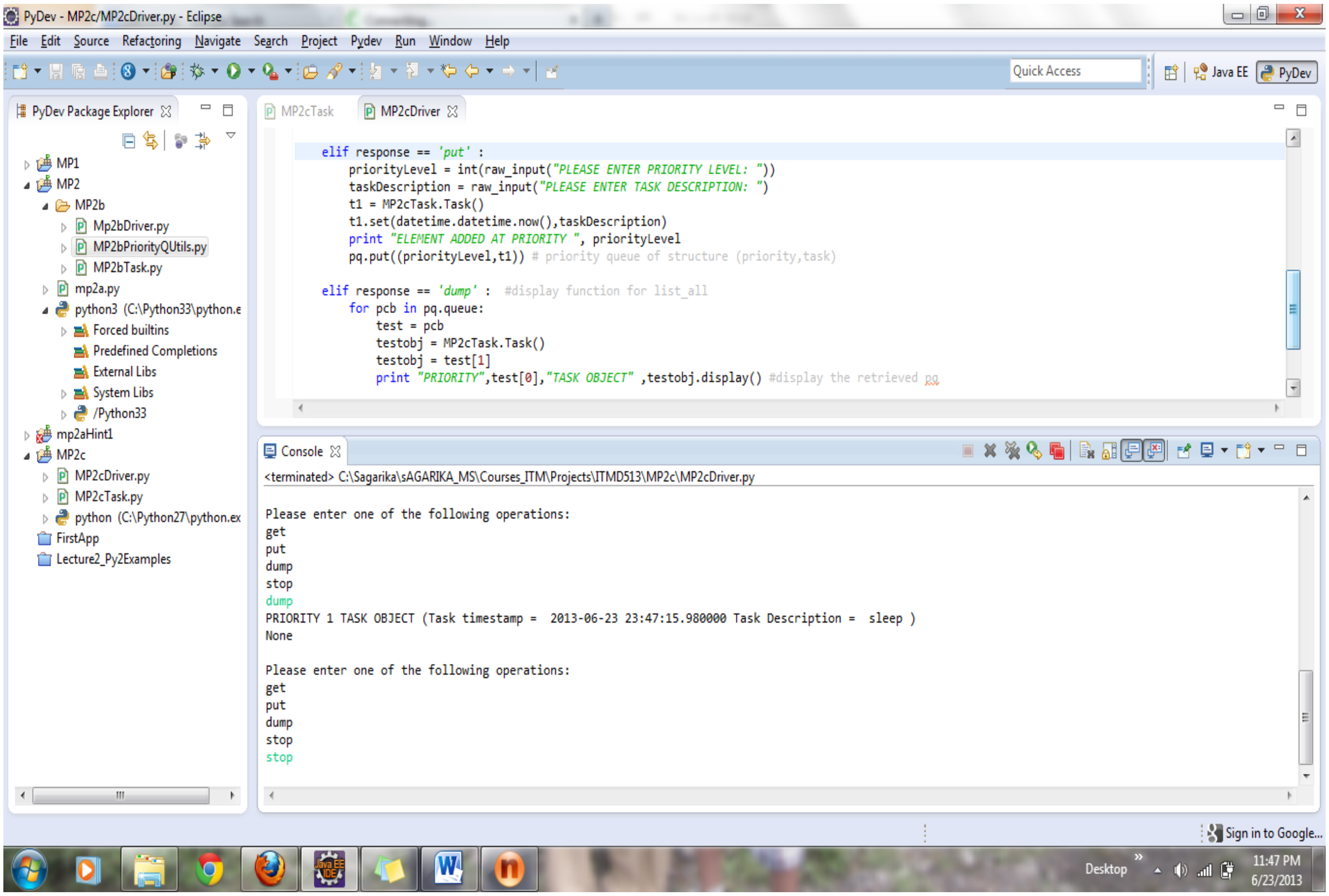
- Dump() – displays all elements in the PQ



```
    elif response == 'put' :
        priorityLevel = int(raw_input("PLEASE ENTER PRIORITY LEVEL: "))
        taskDescription = raw_input("PLEASE ENTER TASK DESCRIPTION: ")
        t1 = MP2cTask.Task()
        t1.set(datetime.datetime.now(),taskDescription)
        print "ELEMENT ADDED AT PRIORITY ", priorityLevel
        pq.put((priorityLevel,t1)) # priority queue of structure (priority,task)

    elif response == 'dump' :  #display function for list_all
        for pcb in pq.queue:
            test = pcb
            testobj = MP2cTask.Task()
            testobj = test[1]
            print "PRIORITY",test[0],"TASK OBJECT" ,testobj.display() #display the retrieved pq
```

```
C:\Sagarika\sAGARIKA_MS\Courses_ITM\Projects\ITMD513\MP2c\MP2cDriver.py
ELEMENT ADDED AT PRIORITY  1

Please enter one of the following operations:
get
put
dump
stop
dump
PRIORITY 1 TASK OBJECT (Task timestamp =  2013-06-23 23:47:15.980000 Task Description =  sleep )
None

Please enter one of the following operations:
get
put
dump
stop
```

- Stop() – exits from user menu



```
    elif response == 'put' :
        priorityLevel = int(raw_input("PLEASE ENTER PRIORITY LEVEL: "))
        taskDescription = raw_input("PLEASE ENTER TASK DESCRIPTION: ")
        t1 = MP2cTask.Task()
        t1.set(datetime.datetime.now(),taskDescription)
        print "ELEMENT ADDED AT PRIORITY ", priorityLevel
        pq.put((priorityLevel,t1)) # priority queue of structure (priority,task)

    elif response == 'dump' :  #display function for list_all
        for pcb in pq.queue:
            test = pcb
            testobj = MP2cTask.Task()
            testobj = test[1]
            print "PRIORITY",test[0],"TASK OBJECT" ,testobj.display() #display the retrieved pq
```

```
<terminated> C:\Sagarika\sAGARIKA_MS\Courses_ITM\Projects\ITMD513\MP2c\MP2cDriver.py

Please enter one of the following operations:
get
put
dump
stop
dump
PRIORITY 1 TASK OBJECT (Task timestamp =  2013-06-23 23:47:15.980000 Task Description =  sleep )
None

Please enter one of the following operations:
get
put
dump
stop
stop
```

Conclusion

Thus the implementation of the project successfully meets the requirements.