MULTIMEDIA UNIVERSITY®

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TCP3151
Integrative Programming and Technologies

Assignment Report

Lab Section: IP1A

BY

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Part 1 – Data related to Lost Item Reporting System

1.1 Brief Introduction of the Data used

The system uses two separates XML files for lost items and found items respectively. For the first XML file – LostItemReport.xml, it shows the items that are reported lost to the Lost and Found Station in Multimedia University Melaka. This XML file using an external DTD file named – LostItemReport.dtd to define its structure and the legal elements and attributes. Besides that, an XSL file – ListOfLostItem.xsl is also linked together to transform the XML elements into XHTML to be displayed to end users.

The root element for LostItemReport.xml is *lostReport*, it consists of zero or more *item* element, each of the *item* has an *id* attribute as primary key of the *item*, *include* attribute is an *IDREFS* used to link related items that are lost together. In the *item*, there are 9 child elements, each of it with its own purpose. The *status* element used to mark the status of the item, its attribute – *choice* may be supplied with "Open" to indicate an item that have lost, "Found" to indicate the item have been found and awaiting to be returned, and lastly "Closed" to indicate the item have been found and returned. The *description* element represents the short description of the item lost. For the *report:datetime* element, it store the date and time when the item is reported lost to the Lost and Found Station, *lost:datetime* imply the date and time range, when the item is suspected lost at, *claim:datetime* reveal the date and time the owner come and claim the item back, shall it is found. The *locations* element may include one or multiple *location* element, it shows the locations where the item is suspected lost at. The *detail* element may include a detail description of the item lost. The *reportBy* shows the owner of the item, the Lost and Found Station may contact this person shall the item is found, by using the email or phone number provided here. The *returnBy* shows the person who found the lost item, and some other information about the person.

For another XML file – FoundItemReport.xml, it shows the found items that are reported to the Lost and Found Station. This XML file linked to an XSL file – ItemTobeClaimed.xsl to display it in XHTML format, and it use an internal DTD to define the elements structure. It had *foundReport* as the root element, and it consist zero or multiple *item* element. The *id* attribute of the *item* element is used to indicate the primary key of the item, and the *include* attribute may link with other items' *id* attribute to indicate the relativity between the items. The *choice* attribute of *status* element is used to indicate the status of the item, where the "Open" imply the item is awaiting to be claimed, and "Closed" imply that the item have

been claimed. The *description* element shows a short description of the item found. For the *report:datetime* element it store the date and time the item is reported to the Lost and Found Station, *found:datetime* shows the date and time the item is being found by the reporting person, *claim:datetime* element shows when the item is being claimed by its owner. The *location* element marks where the item is found at. If there are other detail description of the item found, it may be showed in *detail* element. For the *reportBy* element, it shows the person who found the item and report it to the Lost and Found Station, it also includes some contact information of the person. For *claimBy* element, it shows the person who claimed the item, and some of his/her information.

1.2 XML Documents

LostItemReport.xml

```xml
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<!-- This report is to record the items that are reported LOST to the Lost
and Found Station -->

<!-- External DTD -->
<!DOCTYPE lostReport SYSTEM "LostItemReport.dtd" >

<!-- Link to XSL -->
<?xml-stylesheet type="text/xsl" href="ListOfLostItem.xsl" ?>

<lostReport>
  <item id="L1001" include="L1002">
    <status choice="Closed" />
    <description>Wallet</description>

    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="03" />
      <report:time hour="11" minute="59" />
    </report:datetime>

    <lost:datetime xmlns:lost="http://www.w3.org/xml/lost/">
      <lost:dateFrom year="2019" month="07" date="03" />
      <lost:dateTo year="2019" month="07" date="03" />
      <lost:timeFrom hour="08" minute="00" />
      <lost:timeTo hour="11" minute="30" />
    </lost:datetime>

    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="2019" month="07" date="04" />
      <claim:time hour="08" minute="04" />
    </claim:datetime>

    <locations>
      <location>MSMX0001</location>
      <location>CLC Concourse</location>
    </locations>

    <detail> <![CDATA[
    Black colour, around RM300 inside, include student id - 1131119882, ic -
950101-01-0001, driving license, and aeon member card
    ]]></detail>

    <reportBy>
      <name>
        <firstName>Kah Siang</firstName>
```

```
        <lastName>Koh</lastName>
      </name>
      <email>kahsiang95@hotmail.com</email>
      <phone>0176815218</phone>
      <id>1131119882</id>
    </reportBy>

    <returnBy>
      <name>
        <firstName>Daphne</firstName>
        <lastName>Bunga Dwiputriane</lastName>
      </name>
      <email>1151105086@student.mmu.edu.my</email>
      <phone>0176356898</phone>
      <id>1151105086</id>
    </returnBy>
  </item>

  <item id="L1002"> <!-- indicate an item that have been lost; id incidate
the primary key -->
    <status choice="Closed" /> <!-- Open: Item is awaiting to be found and
returned; Found: Item have been found and awaiting to be returned; Closed:
Item have been found and returned -->
    <description>Student ID</description> <!-- short description of the item
lost -->

    <!-- when the item is reported to the lost and found station -->
    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="03" />
      <report:time hour="11" minute="59" />
    </report:datetime>

    <!-- when the item is suspected lost -->
    <lost:datetime xmlns:lost="http://www.w3.org/xml/lost/">
      <lost:dateFrom year="2019" month="07" date="03" />
      <lost:dateTo year="2019" month="07" date="03" />
      <lost:timeFrom hour="08" minute="00" />
      <lost:timeTo hour="11" minute="30" />
    </lost:datetime>

    <!-- when the item is being claimed by its owner -->
    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="2019" month="07" date="04" />
      <claim:time hour="08" minute="04" />
    </claim:datetime>

    <!-- where the item is suspected lost -->
    <locations>
```

```
      <location>MSMX0001</location>
      <location>CLC Concourse</location>
    </locations>

    <!-- detail description of the item lost -->
    <detail> <![CDATA[
    Student Id: 1131119882
    ]]></detail>

    <!-- item lost is reported by this person -->
    <reportBy>
      <name>
        <firstName>Kah Siang</firstName>
        <lastName>Koh</lastName>
      </name>
      <email>kahsiang95@hotmail.com</email>
      <phone>0176815218</phone>
      <id>1131119882</id>
    </reportBy>

    <!-- item is being found by this person -->
    <returnBy>
      <name>
        <firstName>Daphne</firstName>
        <lastName>Bunga Dwiputriane</lastName>
      </name>
      <email>1151105086@student.mmu.edu.my</email>
      <phone>0176356898</phone>
      <id>1151105086</id>
    </returnBy>
  </item>

  <item id="L1003"> <!-- indicate an item that have been lost; id incidate
the primary key -->
    <status choice="Open" /> <!-- Open: Item is awaiting to be found and
returned; Found: Item have been found and awaiting to be returned; Closed:
Item have been found and returned -->
    <description>Necklace</description> <!-- short description of the item
lost -->

    <!-- when the item is reported to the lost and found station -->
    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="09" />
      <report:time hour="11" minute="30" />
    </report:datetime>

    <!-- when the item is suspected lost -->
    <lost:datetime xmlns:lost="http://www.w3.org/xml/lost/">
```

```
      <lost:dateFrom year="2019" month="07" date="09" />
      <lost:dateTo year="2019" month="07" date="09" />
      <lost:timeFrom hour="09" minute="00" />
      <lost:timeTo hour="11" minute="00" />
    </lost:datetime>

    <!-- when the item is being claimed by its owner -->
    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="" month="" date="" />
      <claim:time hour="" minute="" />
    </claim:datetime>

    <!-- where the item is suspected lost -->
    <locations>
      <location>MAMR4020</location>
    </locations>

    <!-- detail description of the item lost -->
    <detail> <![CDATA[
    Necklace Colour - Silver, Necklace Symbol - Cross, Necklace Length -
Short
    ]]></detail>

    <!-- item lost is reported by this person -->
    <reportBy>
      <name>
        <firstName>Mary Louise</firstName>
        <lastName>Wright</lastName>
      </name>
      <email>marylouiu@gmail.com</email>
      <phone>0103456789</phone>
      <id>118120212</id>
    </reportBy>

    <!-- item is being found by this person -->
    <returnBy>
      <name>
        <firstName></firstName>
        <lastName></lastName>
      </name>
      <email></email>
      <phone></phone>
      <id></id>
    </returnBy>
  </item>

  <item id="L1004">
    <status choice="Found" />
```

```xml
    <description>Laptop Bag</description>

    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="16" />
      <report:time hour="12" minute="50" />
    </report:datetime>

    <lost:datetime xmlns:lost="http://www.w3.org/xml/lost/">
      <lost:dateFrom year="2019" month="07" date="16" />
      <lost:dateTo year="2019" month="07" date="16" />
      <lost:timeFrom hour="11" minute="00" />
      <lost:timeTo hour="12" minute="30" />
    </lost:datetime>

    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="" month="" date="" />
      <claim:time hour="" minute="" />
    </claim:datetime>

    <locations>
      <location>MSMX2008</location>
    </locations>

    <detail> <![CDATA[
    Black colour, messenger bag, Laptop brand - Dell, Laptop Username -
Amabella Klein, Laptop Colour - Grey
    ]]></detail>

    <reportBy>
      <name>
        <firstName>Amabella</firstName>
        <lastName>Klein</lastName>
      </name>
      <email>amabellaklein21@gmail.com</email>
      <phone>0144705658</phone>
      <id>1151105020</id>
    </reportBy>

    <returnBy>
      <name>
        <firstName>Chang He</firstName>
        <lastName>Wong</lastName>
      </name>
      <email>1151105293@student.mmu.edu.my</email>
      <phone>0129161580</phone>
      <id>1151105293</id>
    </returnBy>
  </item>
```

```
  <item id="L1005"> <!-- indicate an item that have been lost; id incidate
the primary key -->
    <status choice="Open" /> <!-- Open: Item is awaiting to be found and
returned; Found: Item have been found and awaiting to be returned; Closed:
Item have been found and returned -->
    <description>Water Bottle</description> <!-- short description of the
item lost -->

    <!-- when the item is reported to the lost and found station -->
    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="12" />
      <report:time hour="14" minute="30" />
    </report:datetime>

    <!-- when the item is suspected lost -->
    <lost:datetime xmlns:lost="http://www.w3.org/xml/lost/">
      <lost:dateFrom year="2019" month="07" date="12" />
      <lost:dateTo year="2019" month="07" date="12" />
      <lost:timeFrom hour="11" minute="00" />
      <lost:timeTo hour="13" minute="00" />
    </lost:datetime>

    <!-- when the item is being claimed by its owner -->
    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="" month="" date="" />
      <claim:time hour="" minute="" />
    </claim:datetime>

    <!-- where the item is suspected lost -->
    <locations>
      <location>MNBR2007</location>
    </locations>

    <!-- detail description of the item lost -->
    <detail> <![CDATA[
   Brand - Tupperware, Colour -Blue, Volume of water - Half empty
    ]]></detail>

    <!-- item lost is reported by this person -->
    <reportBy>
      <name>
        <firstName>Joseph</firstName>
        <lastName>Schooling</lastName>
      </name>
      <email>joeschooling@yahoo.com</email>
      <phone>0165486569</phone>
```

```
      <id>115130444</id>
    </reportBy>

    <!-- item is being found by this person -->
    <returnBy>
      <name>
        <firstName></firstName>
        <lastName></lastName>
      </name>
      <email></email>
      <phone></phone>
      <id></id>
    </returnBy>
  </item>

  <item id="L1006">
    <status choice="Closed" />
    <description>Wallet</description>

    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="03" />
      <report:time hour="12" minute="00" />
    </report:datetime>

    <lost:datetime xmlns:lost="http://www.w3.org/xml/lost/">
      <lost:dateFrom year="2019" month="07" date="03" />
      <lost:dateTo year="2019" month="07" date="03" />
      <lost:timeFrom hour="10" minute="00" />
      <lost:timeTo hour="11" minute="50" />
    </lost:datetime>

    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="2019" month="07" date="10" />
      <claim:time hour="11" minute="00" />
    </claim:datetime>

    <locations>
      <location>ACR1006</location>
    </locations>

    <detail> <![CDATA[
    Colour - Grey, Cash - RM10, Driving License - 100100234, CIMB ATM Card,
Hong Leong Credit Card
    ]]></detail>

    <reportBy>
      <name>
        <firstName>Kosuke</firstName>
```

```
        <lastName>Hagino</lastName>
      </name>
      <email>koshaginojp@yahoo.com</email>
      <phone>0155587202</phone>
      <id>1121202121</id>
    </reportBy>

    <returnBy>
      <name>
        <firstName>Frenkie</firstName>
        <lastName>de Jong</lastName>
      </name>
      <email>fdj21@gmail.com</email>
      <phone>016-6567898</phone>
      <id>1181104554</id>
    </returnBy>
  </item>

  <item id="L1007"> <!-- indicate an item that have been lost; id incidate
the primary key -->
    <status choice="Open" /> <!-- Open: Item is awaiting to be found and
returned; Found: Item have been found and awaiting to be returned; Closed:
Item have been found and returned -->
    <description>House Keys</description> <!-- short description of the item
lost -->

    <!-- when the item is reported to the lost and found station -->
    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="15" />
      <report:time hour="16" minute="00" />
    </report:datetime>

    <!-- when the item is suspected lost -->
    <lost:datetime xmlns:lost="http://www.w3.org/xml/lost/">
      <lost:dateFrom year="2019" month="07" date="15" />
      <lost:dateTo year="2019" month="07" date="15" />
      <lost:timeFrom hour="08" minute="30" />
      <lost:timeTo hour="12" minute="00" />
    </lost:datetime>

    <!-- when the item is being claimed by its owner -->
    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="" month="" date="" />
      <claim:time hour="" minute="" />
    </claim:datetime>

    <!-- where the item is suspected lost -->
    <locations>
```

```
      <location>ACR3002</location>
    </locations>

    <!-- detail description of the item lost -->
    <detail> <![CDATA[
    Number of Keys - 3, Keychain words - Enjoy Spain
    ]]></detail>

    <!-- item lost is reported by this person -->
    <reportBy>
      <name>
        <firstName>Aaron</firstName>
        <lastName>Wan-Bissaka</lastName>
      </name>
      <email>spiderwan97@gmail.com</email>
      <phone>0124202029</phone>
      <id>1141100420</id>
    </reportBy>

    <!-- item is being found by this person -->
    <returnBy>
      <name>
        <firstName></firstName>
        <lastName></lastName>
      </name>
      <email></email>
      <phone></phone>
      <id></id>
    </returnBy>
  </item>

  <item id="L1008">
    <status choice="Closed" />
    <description>Backpack</description>

    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="24" />
      <report:time hour="14" minute="10" />
    </report:datetime>

    <lost:datetime xmlns:lost="http://www.w3.org/xml/lost/">
      <lost:dateFrom year="2019" month="07" date="23" />
      <lost:dateTo year="2019" month="07" date="24" />
      <lost:timeFrom hour="18" minute="00" />
      <lost:timeTo hour="14" minute="00" />
    </lost:datetime>

    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
```

```
      <claim:date year="2019" month="07" date="26" />
      <claim:time hour="15" minute="00" />
    </claim:datetime>

    <locations>
      <location>Exam Hall</location>
    </locations>

    <detail> <![CDATA[
    Colour - Black, Network Security Lecture Notes, Final Year Project
drafts, black pencil case, Sony brand powerbank
    ]]></detail>

    <reportBy>
      <name>
        <firstName>Mohammad</firstName>
        <lastName>Salah</lastName>
      </name>
      <email>mosalah29@hotmail.com</email>
      <phone>0176822910</phone>
      <id>1181100106</id>
    </reportBy>

    <returnBy>
      <name>
        <firstName>Penny</firstName>
        <lastName>Oleksiak</lastName>
      </name>
      <email>typicalpenny@gmail.com</email>
      <phone>016-80902454</phone>
      <id>1141205055</id>
    </returnBy>
  </item>

</lostReport>
```

FoundItemReport.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<!-- This report is to record the items that are reported FOUND to the Lost
and Found Station -->

<!-- Link to XSL -->
<?xml-stylesheet type="text/xsl" href="ItemTobeClaimed.xsl" ?>

<!-- Internal DTD -->
<!DOCTYPE foundReport [

<!ELEMENT foundReport (item*) >
<!ELEMENT item (status, description, report:datetime, found:datetime,
claim:datetime, location, detail, reportBy, claimBy) >
<!ELEMENT status EMPTY >
<!ELEMENT description (#PCDATA) >
<!ELEMENT report:datetime (report:date, report:time) >
<!ELEMENT report:date EMPTY >
<!ELEMENT report:time EMPTY >
<!ELEMENT found:datetime (found:date, found:time) >
<!ELEMENT found:date EMPTY >
<!ELEMENT found:time EMPTY >
<!ELEMENT claim:datetime (claim:date, claim:time) >
<!ELEMENT claim:date EMPTY >
<!ELEMENT claim:time EMPTY >
<!ELEMENT location (#PCDATA) >
<!ELEMENT detail (#PCDATA) >
<!ELEMENT reportBy (name, email, phone, id) >
<!ELEMENT claimBy (name, email, phone, id) >
<!ELEMENT name (firstName, lastName) >
<!ELEMENT firstName (#PCDATA) >
<!ELEMENT lastName (#PCDATA) >
<!ELEMENT email (#PCDATA) >
<!ELEMENT phone (#PCDATA) >
<!ELEMENT id (#PCDATA) >


<!ATTLIST item id ID #REQUIRED >
<!ATTLIST item include IDREFS #IMPLIED>
<!ATTLIST status choice (Open | Closed) #REQUIRED >
<!ATTLIST report:datetime xmlns:report CDATA #FIXED
"http://www.w3.org/xml/report/">
<!ATTLIST report:date
  year CDATA #REQUIRED
  month CDATA #REQUIRED
  date CDATA #REQUIRED
>
<!ATTLIST report:time
```

```
  hour CDATA #REQUIRED
  minute CDATA #REQUIRED
>

<!ATTLIST found:datetime xmlns:found CDATA #FIXED
"http://www.w3.org/xml/found/">
<!ATTLIST found:date
  year CDATA #REQUIRED
  month CDATA #REQUIRED
  date CDATA #REQUIRED
>
<!ATTLIST found:time
  hour CDATA #REQUIRED
  minute CDATA #REQUIRED
>

<!ATTLIST claim:datetime xmlns:claim CDATA #FIXED
"http://www.w3.org/xml/claim/">
<!ATTLIST claim:date
  year CDATA #REQUIRED
  month CDATA #REQUIRED
  date CDATA #REQUIRED
>
<!ATTLIST claim:time
  hour CDATA #REQUIRED
  minute CDATA #REQUIRED
>

]>

<foundReport>

  <item id="F2001"> <!-- indicate an item that have been found; id incidate
the primary key -->
    <status choice="Open" /> <!-- Open: Item is awaiting to be claimed;
Closed: Item have been claimed -->
    <description>Watch</description> <!-- short description of the item
found -->

    <!-- when the item is reported to the lost and found station -->
    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="03" />
      <report:time hour="17" minute="26" />
    </report:datetime>

    <!-- when the item is being found by the reporting person -->
    <found:datetime xmlns:found="http://www.w3.org/xml/found/">
      <found:date year="2019" month="07" date="03" />
```

```
      <found:time hour="17" minute="00" />
    </found:datetime>

    <!-- when the item is being claimed by its owner -->
    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="" month="" date="" />
      <claim:time hour="" minute="" />
    </claim:datetime>

    <!-- where the item is being found by the reporting person -->
    <location>MSMX2003</location>

    <!-- detail description of the item found -->
    <detail> <![CDATA[
    Model: GA-2000S-1A
    Colour: Black
    ]]></detail>

    <!-- item found is reported by this person -->
    <reportBy>
      <name>
        <firstName>Chang He</firstName>
        <lastName>Wong</lastName>
      </name>
      <email>1151105293@student.mmu.edu.my</email>
      <phone>012-9161580</phone>
      <id>1151105293</id>
    </reportBy>

    <!-- item is being claimed by this person -->
    <claimBy>
      <name>
        <firstName></firstName>
        <lastName></lastName>
      </name>
      <email></email>
      <phone></phone>
      <id></id>
    </claimBy>
  </item>

  <item id="F2002" include="F2003"> <!-- indicate an item that have been
found; id incidate the primary key -->
    <status choice="Closed" /> <!-- Open: Item is awaiting to be claimed;
Closed: Item have been claimed -->
    <description>Book - "Sapiens"</description> <!-- short description of
the item found -->
```

```
<!-- when the item is reported to the lost and found station -->
<report:datetime xmlns:report="http://www.w3.org/xml/report/">
  <report:date year="2019" month="07" date="04" />
  <report:time hour="13" minute="21" />
</report:datetime>

<!-- when the item is being found by the reporting person -->
<found:datetime xmlns:found="http://www.w3.org/xml/found/">
  <found:date year="2019" month="07" date="04" />
  <found:time hour="13" minute="00" />
</found:datetime>

<!-- when the item is being claimed by its owner -->
<claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
  <claim:date year="2019" month="07" date="05" />
  <claim:time hour="11" minute="12" />
</claim:datetime>

<!-- where the item is being found by the reporting person -->
<location>Library, Second Floor</location>

<!-- detail description of the item found -->
<detail> <![CDATA[
A book by Yuval Noah Harari.
The owner's name is written on the cover of the book -- "Enzo Cheng".
-Besides a wireless keyboard
-One of the tables on second floor of the library
]]></detail>

<!-- item found is reported by this person -->
<reportBy>
  <name>
    <firstName>Daphne</firstName>
    <lastName>Flower</lastName>
  </name>
  <email>Dflower@hotmail.com</email>
  <phone>0129450002</phone>
  <id>1151103434</id>
</reportBy>

<!-- item is being claimed by this person -->
<claimBy>
  <name>
    <firstName>Enzo</firstName>
    <lastName>Cheng</lastName>
  </name>
  <email>enzocheng977@hotmail.com</email>
  <phone>013-3333333</phone>
```

```
      <id>1151010001</id>
    </claimBy>
  </item>

  <item id="F2003"> <!-- indicate an item that have been found; id incidate
the primary key -->
    <status choice="Closed" /> <!-- Open: Item is awaiting to be claimed;
Closed: Item have been claimed -->
    <description>Wireless Keyboard</description> <!-- short description of
the item found -->

    <!-- when the item is reported to the lost and found station -->
    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="04" />
      <report:time hour="13" minute="21" />
    </report:datetime>

    <!-- when the item is being found by the reporting person -->
    <found:datetime xmlns:found="http://www.w3.org/xml/found/">
      <found:date year="2019" month="07" date="04" />
      <found:time hour="13" minute="00" />
    </found:datetime>

    <!-- when the item is being claimed by its owner -->
    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="2019" month="07" date="05" />
      <claim:time hour="11" minute="12" />
    </claim:datetime>

    <!-- where the item is being found by the reporting person -->
    <location>Library, Second Floor</location>

    <!-- detail description of the item found -->
    <detail> <![CDATA[
    An Alcatroz 2.4G wireless keyboard
    Model: AirPad1
    Colour: Black
    -Has a built-in touch pad
    -A book was lying beside this keyboard.
    -One of the tables on second floor of the library.
    ]]></detail>

       <!-- item found is reported by this person -->
    <reportBy>
      <name>
        <firstName>Daphne</firstName>
        <lastName>Flower</lastName>
      </name>
```

```
      <email>Dflower@hotmail.com</email>
      <phone>0129450002</phone>
      <id>1151103434</id>
    </reportBy>

    <!-- item is being claimed by this person -->
    <claimBy>
      <name>
        <firstName>Enzo</firstName>
        <lastName>Cheng</lastName>
      </name>
      <email>enzocheng977@hotmail.com</email>
      <phone>013-3333333</phone>
      <id>1151010001</id>
    </claimBy>
  </item>

<item id="F2004"> <!-- indicate an item that have been found; id incidate
the primary key -->
    <status choice="Closed" /> <!-- Open: Item is awaiting to be claimed;
Closed: Item have been claimed -->
    <description>Scientific Calculator</description> <!-- short description
of the item found -->

    <!-- when the item is reported to the lost and found station -->
    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="05" />
      <report:time hour="14" minute="21" />
    </report:datetime>

    <!-- when the item is being found by the reporting person -->
    <found:datetime xmlns:found="http://www.w3.org/xml/found/">
      <found:date year="2019" month="07" date="05" />
      <found:time hour="14" minute="13" />
    </found:datetime>

    <!-- when the item is being claimed by its owner -->
    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="2019" month="07" date="05" />
      <claim:time hour="18" minute="00" />
    </claim:datetime>

    <!-- where the item is being found by the reporting person -->
    <location>New LP</location>

    <!-- detail description of the item found -->
    <detail> <![CDATA[
```

```
    A new scientic calculator with a name tag writting, "Andrew Wong
1131140099"
    -Found on one of the tables in new lp
    ]]></detail>

    <!-- item found is reported by this person -->
    <reportBy>
      <name>
        <firstName>Kah Siang</firstName>
        <lastName>Koh</lastName>
      </name>
      <email>KS123@hotmail.com</email>
      <phone>012-9330002</phone>
      <id>1120010022</id>
    </reportBy>

    <!-- item is being claimed by this person -->
    <claimBy>
      <name>
        <firstName>Andrew</firstName>
        <lastName>Wang</lastName>
      </name>
      <email>wang8090@hotmail.com</email>
      <phone>013-3334443</phone>
      <id>1131140099</id>
    </claimBy>
  </item>

  <item id="F2005"> <!-- indicate an item that have been found; id incidate
the primary key -->
    <status choice="Open" /> <!-- Open: Item is awaiting to be claimed;
Closed: Item have been claimed -->
    <description>Portable Harddrive</description> <!-- short description of
the item found -->

    <!-- when the item is reported to the lost and found station -->
    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="11" />
      <report:time hour="15" minute="30" />
    </report:datetime>

    <!-- when the item is being found by the reporting person -->
    <found:datetime xmlns:found="http://www.w3.org/xml/found/">
      <found:date year="2019" month="07" date="11" />
      <found:time hour="13" minute="15" />
    </found:datetime>

    <!-- when the item is being claimed by its owner -->
```

```
    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="" month="" date="" />
      <claim:time hour="" minute="" />
    </claim:datetime>

    <!-- where the item is being found by the reporting person -->
    <location>MSMX3016</location>

    <!-- detail description of the item found -->
    <detail> <![CDATA[
    An blue color Seagate portable harddirve was left on the lecturer's
table in the lecture hall.
    ]]></detail>

    <!-- item found is reported by this person -->
    <reportBy>
      <name>
        <firstName>Elaine</firstName>
        <lastName>Cheng</lastName>
      </name>
      <email>1191191199@hotmail.com</email>
      <phone>014-3339983</phone>
      <id>1191191199</id>
    </reportBy>

    <!-- item is being claimed by this person -->
    <claimBy>
      <name>
        <firstName></firstName>
        <lastName></lastName>
      </name>
      <email></email>
      <phone></phone>
      <id></id>
    </claimBy>
  </item>

  <item id="F2006"> <!-- indicate an item that have been found; id incidate
the primary key -->
    <status choice="Closed" /> <!-- Open: Item is awaiting to be claimed;
Closed: Item have been claimed -->
    <description>Keys</description> <!-- short description of the item found
-->

    <!-- when the item is reported to the lost and found station -->
    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="15" />
      <report:time hour="11" minute="30" />
```

```
    </report:datetime>

    <!-- when the item is being found by the reporting person -->
    <found:datetime xmlns:found="http://www.w3.org/xml/found/">
      <found:date year="2019" month="07" date="15" />
      <found:time hour="10" minute="15" />
    </found:datetime>

    <!-- when the item is being claimed by its owner -->
    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="2019" month="07" date="15" />
      <claim:time hour="12" minute="00" />
    </claim:datetime>

    <!-- where the item is being found by the reporting person -->
    <location>Gym room</location>

    <!-- detail description of the item found -->
    <detail> <![CDATA[
    6 six keys chained by a pink key rings was left on the floor of the gym
room.
    No name tag is chained with the keys.
    A tag stating --"B-11-03-03", is chained with the keychain ring.
    I suppose these are house keys.
    On the floor, beside a chair in the gym room
    ]]></detail>

    <!-- item found is reported by this person -->
    <reportBy>
      <name>
        <firstName>Lillian</firstName>
        <lastName>Wong</lastName>
      </name>
      <email>1191220091@gmail.com</email>
      <phone>018-1113303</phone>
      <id>1191220091</id>
    </reportBy>

    <!-- item is being claimed by this person -->
    <claimBy>
      <name>
        <firstName>Joanna</firstName>
        <lastName>Johnson</lastName>
      </name>
      <email>joannaJohn344@outlook.com</email>
      <phone>011-9623335</phone>
      <id>1161107869</id>
    </claimBy>
```

```
  </item>

 <item id="F2007"> <!-- indicate an item that have been found; id incidate
the primary key -->
    <status choice="Closed" /> <!-- Open: Item is awaiting to be claimed;
Closed: Item have been claimed -->
    <description>Black frame glasses</description> <!-- short description of
the item found -->

    <!-- when the item is reported to the lost and found station -->
    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="15" />
      <report:time hour="16" minute="20" />
    </report:datetime>

    <!-- when the item is being found by the reporting person -->
    <found:datetime xmlns:found="http://www.w3.org/xml/found/">
      <found:date year="2019" month="07" date="15" />
      <found:time hour="15" minute="00" />
    </found:datetime>

    <!-- when the item is being claimed by its owner -->
    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="2019" month="07" date="16" />
      <claim:time hour="09" minute="15" />
    </claim:datetime>

    <!-- where the item is being found by the reporting person -->
    <location>Software Enginnering Lab, MNBR2007</location>

    <!-- detail description of the item found -->
    <detail> <![CDATA[
    A black frame, stylish pair of glasses.
    The brand of the frame is called, "Whoosh".
    A pair of stylish glasses with black color frame.
    Found on a table.
    ]]></detail>

    <!-- item found is reported by this person -->
    <reportBy>
      <name>
        <firstName>Terrence</firstName>
        <lastName>Tam</lastName>
      </name>
      <email>1131188801@outlook.com</email>
      <phone>012-7747731</phone>
      <id>1131188801</id>
    </reportBy>
```

```
    <!-- item is being claimed by this person -->
    <claimBy>
      <name>
        <firstName>Daphne</firstName>
        <lastName>Flower</lastName>
      </name>
      <email>Dflower@hotmail.com</email>
      <phone>012-9450002</phone>
      <id>1151103434</id>
    </claimBy>
  </item>

 <item id="F2008"> <!-- indicate an item that have been found; id incidate
the primary key -->
    <status choice="Open" /> <!-- Open: Item is awaiting to be claimed;
Closed: Item have been claimed -->
    <description>Heart shaped necklace</description> <!-- short description
of the item found -->

    <!-- when the item is reported to the lost and found station -->
    <report:datetime xmlns:report="http://www.w3.org/xml/report/">
      <report:date year="2019" month="07" date="17" />
      <report:time hour="12" minute="40" />
    </report:datetime>

    <!-- when the item is being found by the reporting person -->
    <found:datetime xmlns:found="http://www.w3.org/xml/found/">
      <found:date year="2019" month="07" date="17" />
      <found:time hour="12" minute="20" />
    </found:datetime>

    <!-- when the item is being claimed by its owner -->
    <claim:datetime xmlns:claim="http://www.w3.org/xml/claim/">
      <claim:date year="" month="" date="" />
      <claim:time hour="" minute="" />
    </claim:datetime>

    <!-- where the item is being found by the reporting person -->
    <location>ladies toilet, CLC ground floor</location>

    <!-- detail description of the item found -->
    <detail> <![CDATA[
    A platinum, heart shaped necklace was left on the sink of the ladies
toilet in CLC.
    The necklace is about 20cm long.
    ]]></detail>
```

```
    <!-- item found is reported by this person -->
    <reportBy>
      <name>
        <firstName>Annebelle</firstName>
        <lastName>Ferryman</lastName>
      </name>
      <email>1172281100@gmail.com</email>
      <phone>014-9982234</phone>
      <id>1172281100</id>
    </reportBy>

    <!-- item is being claimed by this person -->
    <claimBy>
      <name>
        <firstName></firstName>
        <lastName></lastName>
      </name>
      <email></email>
      <phone></phone>
      <id></id>
    </claimBy>
  </item>
</foundReport>
```

1.3 Logical View

Logical View for LostItemReport.xml

Figure 1 shows the logical view of first 2 child elements based on LostItemReport.xml. You may refer to softcopy suppose that the image is not clear.

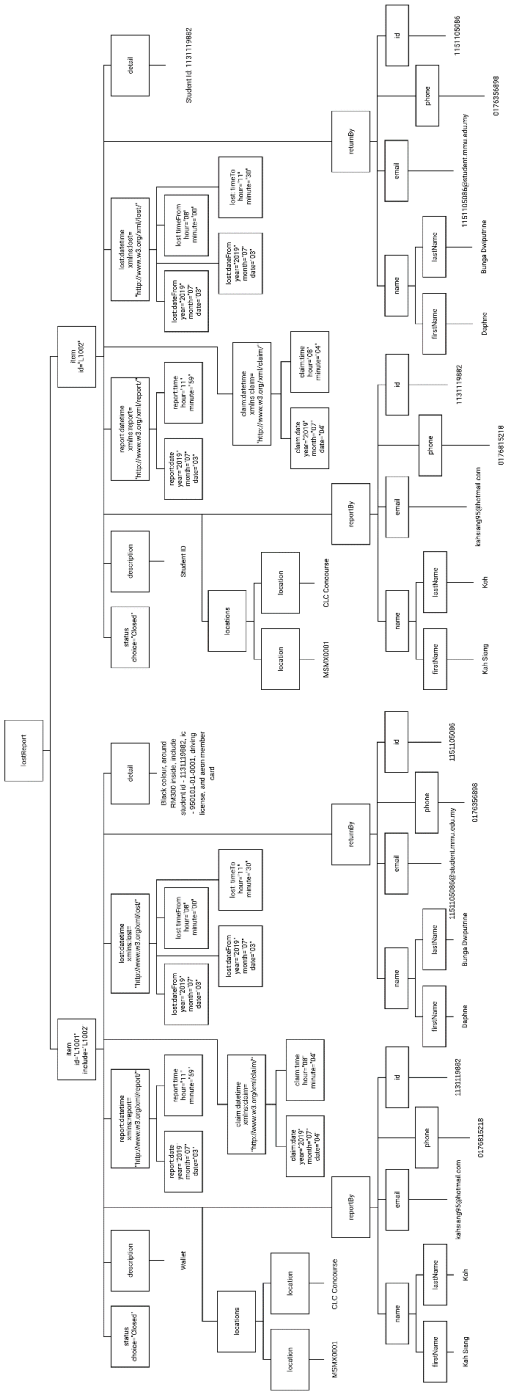


Figure 1 Logical View for LostItemReport.xml

Logical View for FoundItemReport.xml

Figure 2 shows the logical view of first 2 child elements based on FoundItemReport.xml. You may refer to softcopy suppose that the image is not clear.

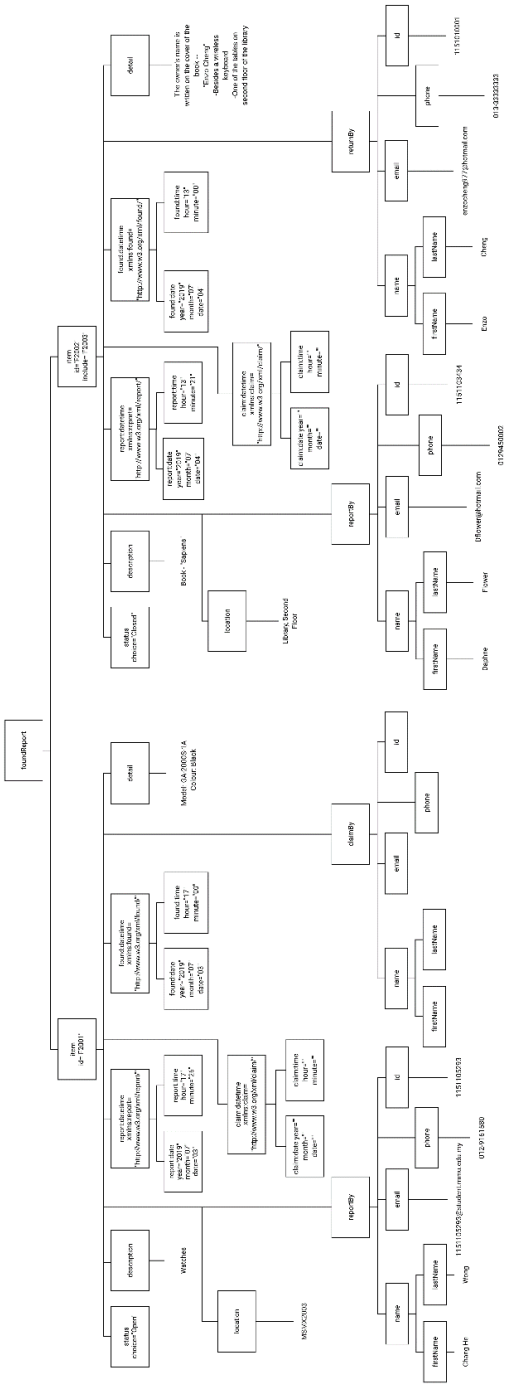


Figure 2 Logical View for FoundItemReport.xml

1.4 DTD Documents

LostItemReport.dtd for LostItemReport.xml

```
<!ELEMENT lostReport (item*) >
<!ELEMENT item (status, description, report:datetime, lost:datetime,
claim:datetime, locations, detail, reportBy, returnBy) >
<!ELEMENT status EMPTY >
<!ELEMENT description (#PCDATA) >
<!ELEMENT report:datetime (report:date, report:time) >
<!ELEMENT report:date EMPTY >
<!ELEMENT report:time EMPTY >
<!ELEMENT lost:datetime (lost:dateFrom, lost:dateTo, lost:timeFrom,
lost:timeTo) >
<!ELEMENT lost:dateFrom EMPTY >
<!ELEMENT lost:dateTo EMPTY >
<!ELEMENT lost:timeFrom EMPTY >
<!ELEMENT lost:timeTo EMPTY >
<!ELEMENT claim:datetime (claim:date, claim:time) >
<!ELEMENT claim:date EMPTY >
<!ELEMENT claim:time EMPTY >
<!ELEMENT locations (location+)>
<!ELEMENT location (#PCDATA) >
<!ELEMENT detail (#PCDATA) >
<!ELEMENT reportBy (name, email, phone, id) >
<!ELEMENT returnBy (name, email, phone, id) >
<!ELEMENT name (firstName, lastName) >
<!ELEMENT firstName (#PCDATA) >
<!ELEMENT lastName (#PCDATA) >
<!ELEMENT email (#PCDATA) >
<!ELEMENT phone (#PCDATA) >
<!ELEMENT id (#PCDATA) >

<!ATTLIST item id ID #REQUIRED >
<!ATTLIST item include IDREFS #IMPLIED>
<!ATTLIST status choice (Open | Found | Closed) #REQUIRED >
<!ATTLIST report:datetime xmlns:report CDATA #FIXED
"http://www.w3.org/xml/report/">
<!ATTLIST report:date
  year CDATA #REQUIRED
  month CDATA #REQUIRED
  date CDATA #REQUIRED
>
<!ATTLIST report:time
  hour CDATA #REQUIRED
  minute CDATA #REQUIRED
>
<!ATTLIST lost:datetime xmlns:lost CDATA #FIXED
"http://www.w3.org/xml/lost/">
```

```
<!ATTLIST lost:dateFrom
  year CDATA #REQUIRED
  month CDATA #REQUIRED
  date CDATA #REQUIRED
>
<!ATTLIST lost:dateTo
  year CDATA #REQUIRED
  month CDATA #REQUIRED
  date CDATA #REQUIRED
>
<!ATTLIST lost:timeFrom
  hour CDATA #REQUIRED
  minute CDATA #REQUIRED
>
<!ATTLIST lost:timeTo
  hour CDATA #REQUIRED
  minute CDATA #REQUIRED
>
<!ATTLIST claim:datetime xmlns:claim CDATA #FIXED
"http://www.w3.org/xml/claim/">
<!ATTLIST claim:date
  year CDATA #REQUIRED
  month CDATA #REQUIRED
  date CDATA #REQUIRED
>
<!ATTLIST claim:time
  hour CDATA #REQUIRED
  minute CDATA #REQUIRED
>
```

DTD for FoundItemReport.xml

It is an internal DTD included together with FoundItemReport.xml.

1.5 XSLT Codes

ListOfLostItem.xsl for LostItemReport.xml

```
<?xml version="1.0" encoding="UTF-8" ?>

<xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:report="http://www.w3.org/xml/report/"
  xmlns:lost="http://www.w3.org/xml/lost/"
  xmlns:claim="http://www.w3.org/xml/claim/">

<xsl:template match="/">
  <html>
    <head>
      <title>List of Lost Item</title>

      <style>
      #lostItem {
        font-family: "Trebuchet MS", Arial, Helvetica, sans-serif;
        border-collapse: collapse;
        width: 100%;
      }

      #lostItem td, #lostItem th {
        border: 1px solid #ddd;
        padding: 8px;
      }

      #lostItem tr:nth-child(even){background-color: #f2f2f2;}

      #lostItem tr:hover {background-color: #ddd;}

      #lostItem th {
        padding-top: 12px;
        padding-bottom: 12px;
        text-align: left;
        background-color: #64b5f6;
        color: white;
      }

      .open {
        color: #66bb6a;
      }

      .closed {
        color: #ef5350;
      }
```

```
      .found {
        color: #ffa726;
      }
      </style>
    </head>
    <body>
      <h2>List of Lost Item</h2>
      <table id="lostItem">
        <tr>
          <th>Item ID</th>
          <th>Item</th>
          <th>Status</th>
          <th colspan="2">Lost between</th>
          <th>Where its lost</th>
          <th>Detail</th>
          <th>Report By</th>
          <th>Email</th>
          <th>Phone Number</th>
          <th>ID</th>
        </tr>

        <xsl:for-each select="lostReport/item">
          <!--<xsl:if test="status/@choice='Open'">-->
          <tr>
            <td><xsl:value-of select="@id" /></td>
            <td><xsl:value-of select="description" /></td>

            <xsl:choose>
              <xsl:when test="status/@choice='Open'">
                <td class="open"><xsl:value-of select="status/@choice"
/></td>
              </xsl:when>
              <xsl:when test="status/@choice='Found'">
                <td class="found"><xsl:value-of select="status/@choice"
/></td>
              </xsl:when>
              <xsl:otherwise>
                <td class="closed"><xsl:value-of select="status/@choice"
/></td>
              </xsl:otherwise>
            </xsl:choose>
            <td>
              <xsl:value-of select="lost:datetime/lost:dateFrom/@year" />-
<xsl:value-of select="lost:datetime/lost:dateFrom/@month" />-<xsl:value-of
select="lost:datetime/lost:dateFrom/@date" />@<xsl:value-of
select="lost:datetime/lost:timeFrom/@hour" />:<xsl:value-of
select="lost:datetime/lost:timeFrom/@minute" />
            </td>
```

```
            <td>
              <xsl:value-of select="lost:datetime/lost:dateTo/@year" />-
<xsl:value-of select="lost:datetime/lost:dateTo/@month" />-<xsl:value-of
select="lost:datetime/lost:dateTo/@date" />@<xsl:value-of
select="lost:datetime/lost:timeTo/@hour" />:<xsl:value-of
select="lost:datetime/lost:timeTo/@minute" />
            </td>
            <td>
              <xsl:for-each select="locations/location">
                -<xsl:value-of select="." /><br/>
              </xsl:for-each>
            </td>
            <td><xsl:value-of select="detail" /></td>
            <td><xsl:value-of select="reportBy/name/firstName" /></td>
            <td><xsl:value-of select="reportBy/email" /></td>
            <td><xsl:value-of select="reportBy/phone" /></td>
            <td><xsl:value-of select="reportBy/id" /></td>
          </tr>
          <!--</xsl:if>-->
        </xsl:for-each>
      </table>
    </body>
  </html>
</xsl:template>
</xsl:stylesheet>
```

ItemTobeClaimed.xsl for FoundItemReport.xml

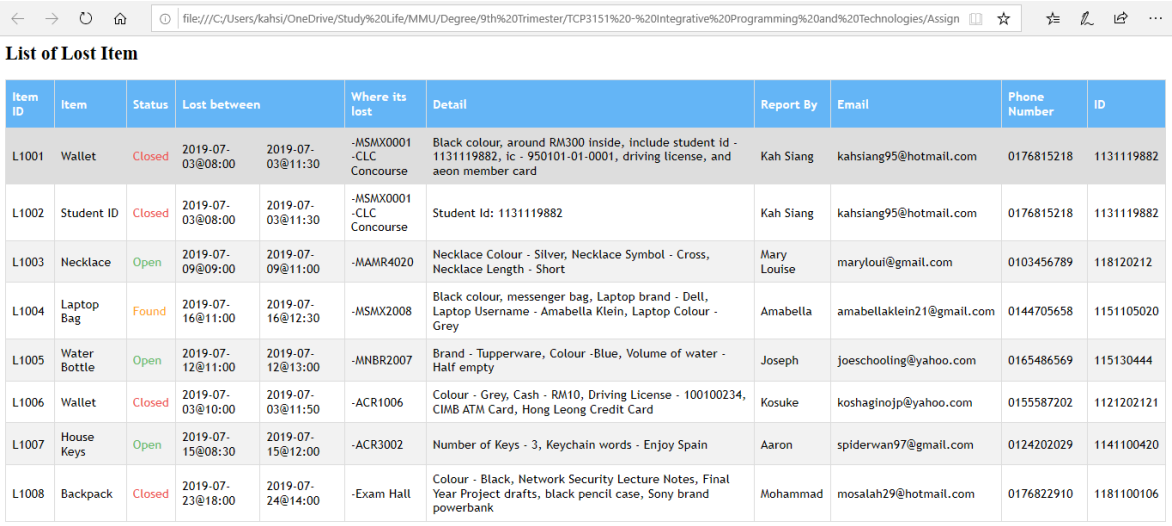
```
<?xml version="1.0" encoding="UTF-8" ?>

<xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:report="http://www.w3.org/xml/report/"
  xmlns:found="http://www.w3.org/xml/found/"
  xmlns:claim="http://www.w3.org/xml/claim/">

  <xsl:template match="/">
    <html>
      <head>
        <title>Items to be Claimed</title>

        <style>
        .foundItem {
          font-family: "Trebuchet MS", Arial, Helvetica, sans-serif;
          border-collapse: collapse;
          width: 100%;
        }

        .foundItem td, .foundItem th {
          border: 1px solid #ddd;
          padding: 8px;
        }

        .foundItem tr:nth-child(even){background-color: #f2f2f2;}

        .foundItem tr:hover {background-color: #ddd;}

        .foundItem th {
          padding-top: 12px;
          padding-bottom: 12px;
          text-align: left;
          background-color: #c63f17;
          color: white;
        }
        </style>
      </head>

      <body>
        <h2>Items to be Claimed</h2>
        <xsl:apply-templates/>
      </body>
    </html>
  </xsl:template>

  <xsl:template match="item">
```

```
    <xsl:if test="status/@choice='Open'">
      <table class="foundItem">
        <tr>
          <th colspan="2"><xsl:apply-templates select="@id" /> - <xsl:apply-
templates select="description" /></th>
        </tr>
        <tr><xsl:apply-templates select="found:datetime" /></tr>
        <tr><xsl:apply-templates select="location" /></tr>
        <tr><xsl:apply-templates select="detail" /></tr>
        <tr style="height:20px;"></tr>
      </table>
    </xsl:if>
  </xsl:template>

  <xsl:template match="@id">
    <xsl:value-of select="."/>
  </xsl:template>

  <xsl:template match="description">
    <xsl:value-of select="."/>
  </xsl:template>

  <xsl:template match="found:datetime">
    <td style="width:130px">When its found: </td>
    <td><xsl:apply-templates select="found:date" /> @  <xsl:apply-templates
select="found:time" /></td>
  </xsl:template>

  <xsl:template match="found:date">
    <xsl:value-of select="@year" />-<xsl:value-of select="@month" />-
<xsl:value-of select="@date" />
  </xsl:template>

  <xsl:template match="found:time">
    <xsl:value-of select="@hour" />:<xsl:value-of select="@minute" />
  </xsl:template>

  <xsl:template match="location">
    <td>Location found: </td>
    <td><xsl:value-of select="."/></td>
  </xsl:template>

  <xsl:template match="detail">
    <td>Detail: </td>
    <td><xsl:value-of select="." /></td>
  </xsl:template>

</xsl:stylesheet>
```

1.6 HTML Outputs

ListOfLostItem.xsl for LostItemReport.xml

Figure 3 shows the print screen of the LostItemReport.xml output after transform with ListOfLostItem.xsl. The XSL file extract some useful information from the XML file and display it in a table form. Besides that, the status of the items is coloured with respect to its status, to ease the end user to find the relevant items.



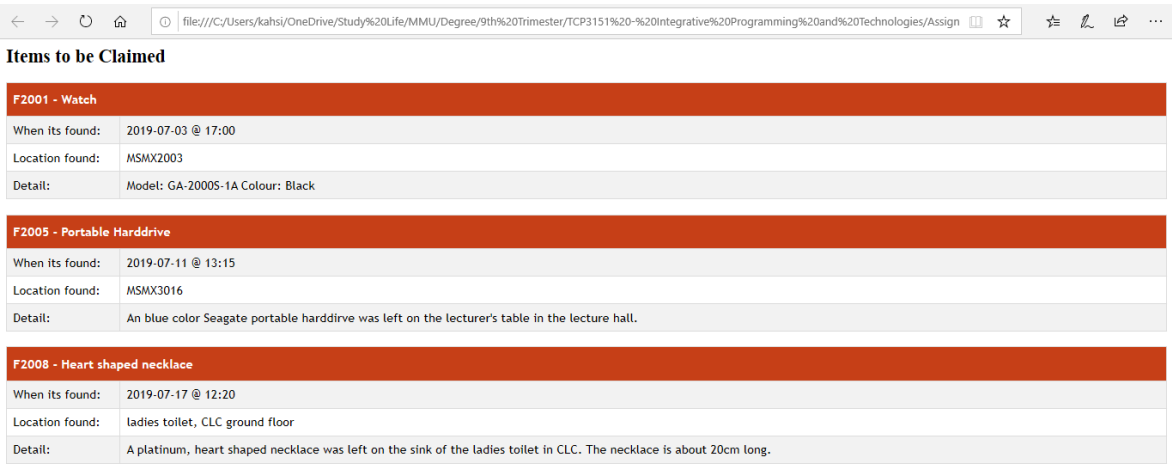
List of Lost Item

Item ID	Item	Status	Lost between		Where its lost	Detail	Report By	Email	Phone Number	ID
L1001	Wallet	Closed	2019-07-03@08:00	2019-07-03@11:30	-MSMX0001 -CLC Concourse	Black colour, around RM300 inside, include student id - 1131119882, ic - 950101-01-0001, driving license, and aeon member card	Kah Siang	kahsiang95@hotmail.com	0176815218	1131119882
L1002	Student ID	Closed	2019-07-03@08:00	2019-07-03@11:30	-MSMX0001 -CLC Concourse	Student Id: 1131119882	Kah Siang	kahsiang95@hotmail.com	0176815218	1131119882
L1003	Necklace	Open	2019-07-09@09:00	2019-07-09@11:00	-MAMR4020	Necklace Colour - Silver, Necklace Symbol - Cross, Necklace Length - Short	Mary Louise	maryloui@gmail.com	0103456789	118120212
L1004	Laptop Bag	Found	2019-07-16@11:00	2019-07-16@12:30	-MSMX2008	Black colour, messenger bag, Laptop brand - Dell, Laptop Username - Amabella Klein, Laptop Colour - Grey	Amabella	amabellaklein21@gmail.com	0144705658	1151105020
L1005	Water Bottle	Open	2019-07-12@11:00	2019-07-12@13:00	-MNBR2007	Brand - Tupperware, Colour -Blue, Volume of water - Half empty	Joseph	joeschooling@yahoo.com	0165486569	115130444
L1006	Wallet	Closed	2019-07-03@10:00	2019-07-03@11:50	-ACR1006	Colour - Grey, Cash - RM10, Driving License - 100100234, CIMB ATM Card, Hong Leong Credit Card	Kosuke	koshaginojp@yahoo.com	0155587202	1121202121
L1007	House Keys	Open	2019-07-15@08:30	2019-07-15@12:00	-ACR3002	Number of Keys - 3, Keychain words - Enjoy Spain	Aaron	spiderwan97@gmail.com	0124202029	1141100420
L1008	Backpack	Closed	2019-07-23@18:00	2019-07-24@14:00	-Exam Hall	Colour - Black, Network Security Lecture Notes, Final Year Project drafts, black pencil case, Sony brand powerbank	Mohammad	mosalah29@hotmail.com	0176822910	1181100106

Figure 3 Print Screen of XHTML Output of LostItemReport.xml

ItemTobeClaimed.xsl for FoundItemReport.xml

Figure 4 shows the print screen of FoundItemReport.xml output after transform with ItemTobeClaimed.xsl. The XSL file extract some important information from the XML file and display it in a tabular form. It will only show the items where its status is “Open” and hide other items which have been claimed. This may ease the end user to find the items which are awaiting to be claimed by its owner.



Items to be Claimed

F2001 - Watch	
When its found:	2019-07-03 @ 17:00
Location found:	MSMX2003
Detail:	Model: GA-2000S-1A Colour: Black

F2005 - Portable Harddrive	
When its found:	2019-07-11 @ 13:15
Location found:	MSMX3016
Detail:	An blue color Seagate portable harddirve was left on the lecturer's table in the lecture hall.

F2008 - Heart shaped necklace	
When its found:	2019-07-17 @ 12:20
Location found:	ladies toilet, CLC ground floor
Detail:	A platinum, heart shaped necklace was left on the sink of the ladies toilet in CLC. The necklace is about 20cm long.

Figure 4 Print Screen of XHTML Output of FoundItemReport.xml

Part 2 – JNI Program

2.1 JNI Program Codes

Question 1

ClassifyHonours.java

```
import java.util.Scanner;
import java.io.IOException;

class ClassifyHonours{
  // Native methods
  private native String classifyDiploma(double cgpa);
  private native String classifyDegree();
  private native void estimateNextGPA(double cgpa);

  private double jCgpa;

  // To clear the terminal
  public static void clearScreen(){
    try {
      new ProcessBuilder("cmd", "/c", "cls").inheritIO().start().waitFor();
    } catch (InterruptedException | IOException e) {
      e.printStackTrace();
    }
  }

  // Header line for the CLI program
  private void displayTitle(){
    System.out.println("Classification of Honours");
    System.out.println("-----------------------------------------------------
");
  }

  // get selection of qualification from user
  private int getSelection(Scanner scanner){
    int selection;
    boolean error;

    // clear the terminal
    ClassifyHonours.clearScreen();

    displayTitle();
    System.out.println("1. Diploma");
    System.out.println("2. Degree");
    System.out.print("Please select your qualification: ");

    do{
```

```
      error = false;

      // get the user's input as selection
      try{
        selection = Integer.parseInt(scanner.nextLine());
      }
      // if user input is not a number
      catch(NumberFormatException e){
        selection = 0;
      }

      // if the selection is not 1 or 2, ask the user to re-enter it again
until a valid selection is made
      if(selection != 1 && selection != 2){
        System.out.println();
        System.out.println("Invalid selection!");
        System.out.print("Please select your qualification (1|2): ");

        error = true;
      }
    } while(error);

    return selection;
  }

  // Get CGPA from user input
  private double getCgpa(Scanner scanner){
    double cgpa;
    boolean error;
    String decimalError;

    System.out.print("Please enter your current CGPA: ");

    do{
      error = false;
      decimalError = "";

      // get user's input as cgpa
      try{
        cgpa = Double.parseDouble(scanner.nextLine());
      }
      // if user input is not a number
      catch(NumberFormatException e){
        cgpa = -1;
      }

      // if the cgpa is not in the valid range, ask the user to re-enter
again, until a valid input is inserted
```

```
      if(cgpa < 0 || cgpa > 4){
        error = true;
      }
      // if the cgpa inserted is not 2 decimal places
      else if(!validDecimalPlaces(cgpa, 2)){
        decimalError = " CGPA must be within 2 decimal places";
        error = true;
      }

      // display error message
      if(error){
        System.out.println();
        System.out.println("Invalid input!" + decimalError);
        System.out.print("Please enter your current CGPA (0.00 - 4.00): ");
      }

    } while(error);

    return cgpa;
  }

  private boolean validDecimalPlaces(double number, int places){
    String text = Double.toString(Math.abs(number));
    int integerPlaces = text.indexOf('.');
    int decimalPlaces = text.length() - integerPlaces - 1;

    return (decimalPlaces <= places);
  }

  // To calculate the GPA to get for current trimester, given the target
CGPA
  private boolean calculateNextGPA(Scanner scanner){
    String input;

    System.out.println();
    System.out.print("Do you wish to calculate the target GPA to get for
current trimester? (Y|N): ");
    // get user's input
    input = scanner.nextLine();
    input = input.toUpperCase();

    // if input is not "Y" or "YES", will be evaluate as "N" or false
    if (input.equals("Y") || input.equals("YES")){
      return true;
    }
    else{
      return false;
    }
```

```
  }

  public static void main(String[] args){
    String honour = "";
    boolean calculateNext = false;
    ClassifyHonours classification = new ClassifyHonours();

    Scanner scanner = new Scanner(System.in);
    // Get user input for qualification
    int selection = classification.getSelection(scanner);
    // Get user inpur as CGPA
    double cgpa = classification.getCgpa(scanner);

    // if the cgpa is fail
    if(cgpa < 2){
      System.out.println("Your are not qualified to get any certificate with
your current CGPA of " + cgpa + ".");
    }
    else{
      switch(selection){
        case 1:
          // return the classification of honour
          honour = classification.classifyDiploma(cgpa);
          break;
        case 2:
          // just to demostrate another way to get cgpa'value
          // assign cgpa to instance variable 'jCgpa'
          classification.jCgpa = cgpa;
          // return the classification of honour
          honour = classification.classifyDegree();
          break;
      }

      // Display the result in command prompt
      System.out.println("Your are qualified to get \"" + honour + "\"
certificate with your current CGPA of " + cgpa + ".");
    }

    // To calculate the GPA to get for current trimester, given the target
CGPA
    calculateNext = classification.calculateNextGPA(scanner);
    if(calculateNext){
      classification.estimateNextGPA(cgpa);
    }

    // avoid resource leak
    scanner.close();
  }
```

```
  // Load library files
  static{
    System.loadLibrary("DiplomaClassification");
    System.loadLibrary("DegreeClassification");
    System.loadLibrary("EstimateNextGPA");
  }
}
```

DegreeClassification.c

```
#include <stdio.h>
#include <jni.h>
#include <string.h>

JNIEXPORT jstring JNICALL Java_ClassifyHonours_classifyDegree(JNIEnv *env,
jobject object){
    char honour[15] = "Fail";

    // just to demostrate another way to get cgpa'value
    // To get cgpa's value from Java
    jclass clazz = (*env)->GetObjectClass(env, object);
    jfieldID fid = (*env)->GetFieldID(env, clazz, "jCgpa", "D");
    jdouble cgpa = (*env)->GetDoubleField(env, object, fid);

    if(cgpa >= 3.67){
        strncpy(honour, "First", 15);
    }
    else if(cgpa >= 3.33){
        strncpy(honour, "Second Upper", 15);
    }
    else if(cgpa >= 2.67){
        strncpy(honour, "Second Lower", 15);
    }
    else if(cgpa >= 2.0){
        strncpy(honour, "Third", 15);
    }

    // convert char[] to java.lang.String
    return (*env)->NewStringUTF(env, honour);
}
```

DiplomaClassification.c

```
#include <stdio.h>
#include <jni.h>
#include <string.h>
```

```
JNIEXPORT jstring JNICALL Java_ClassifyHonours_classifyDiploma(JNIEnv *env,
jobject object, jdouble cgpa){
    char honour[15] = "Fail";

    if(cgpa >= 3.5){
        strncpy(honour, "Distinction", 15);
    }
    else if(cgpa >= 3.0){
        strncpy(honour, "Credit", 15);
    }
    else if(cgpa >= 2.0){
        strncpy(honour, "Pass", 15);
    }

    // convert char[] to java.lang.String
    return (*env)->NewStringUTF(env, honour);
}
```

EstimateNextGPA.c

```
#include <stdio.h>
#include <jni.h>
#include <string.h>
#include <stdlib.h>
#include <stdbool.h>
#include <ctype.h>

// evaluate whether the string is integer
int isInteger(char credit[]){
    bool valid = false;
    int len = strlen(credit);

    // strip trailing newline or other white space
    while (len > 0 && isspace(credit[len - 1])){
        len--;
    }

    if (len > 0)
    {
        valid = true;
        for (int i = 0; i < len; i++)
        {
            if (!isdigit(credit[i]))
            {
                valid = false;
                break;
            }
        }
```

```
    }

    return valid;
}

// get the credit hours earned
int getCompletedCredit(){
    char completedCreditString[15];
    bool error;

    do{
        error = false;

        // get input from user
        printf("Your completed credit hours: ");
        scanf("%s", completedCreditString);

        // if the input is not positive integer, prompt error message, and
get the user input again
        if(!isInteger(completedCreditString)){
            printf("\nInvalid input! Positive integer only!\n");
            error = true;
        }
    } while(error);

    // convert string to int
    return atoi(completedCreditString);
}

// get the currently taking credit hours by the users
int getCurrentCredit(){
    char currentCreditString[15];
    bool error;

    do{
        error = false;

        // get input from user
        printf("Your current credit hours: ");
        scanf("%s", currentCreditString);

        // if the input is not positive integer, prompt error message, and
get the user input again
        if(!isInteger(currentCreditString)){
            printf("\nInvalid input! Positive integer only!\n");
            error = true;
        }
    } while(error);
```

```
    // convert string to int
    return atoi(currentCreditString);
}

// get the target cgpa user wish to achieve
float getTargetCgpa(JNIEnv *env, jobject object, jdouble currentCgpa){
    jdouble targetCgpa;
    char targetCgpaString[15];
    bool error;

    // connect the java's method
    jclass clazz = (*env)->GetObjectClass(env, object);
    jmethodID mid = (*env)->GetMethodID(env, clazz, "validDecimalPlaces",
"(DI)Z");

    do{
        error = false;

        // get user input
        printf("Your target CGPA for this trimester: ");
        scanf("%s", targetCgpaString);
        // convert user input to double
        targetCgpa = atof(targetCgpaString);

        // if the input is lesser than current cgpa or greater than 4,
prompt error, and get user input again
        if(targetCgpa < currentCgpa || targetCgpa > 4){
            printf("\nInvalid input! CGPA should be within (%.2f -
4.00)!\n", currentCgpa);
            error = true;
        }
        // if the cgpa inserted is not 2 decimal places
        else if(!(*env)->CallBooleanMethod(env, object, mid, targetCgpa,
2)){
            printf("\nInvalid input! CGPA must be within 2 decimal
places!\n");
            error = true;
        }
    } while(error);

    return targetCgpa;
}

// calculate the gpa to get in this trimester in order to get the target
cgpa
float calculateGpaToGet(float currentCgpa, int completedCredit, int
currentCredit, float targetCgpa){
```

```
    return ((targetCgpa * (currentCredit + completedCredit)) - (currentCgpa
* completedCredit)) / currentCredit;
}

JNIEXPORT void JNICALL Java_ClassifyHonours_estimateNextGPA(JNIEnv *env,
jobject object, jdouble currentCgpa){
    int completedCredit;
    int currentCredit;
    float targetCgpa;
    float gpaToGet;

    // display the current cgpa
    printf("Your current CGPA: %.2f\n", currentCgpa);
    // get the credit hours earned
    completedCredit = getCompletedCredit();
    // get the currently taking credit hours by the users
    currentCredit = getCurrentCredit();
    // get the target cgpa user wish to achieve
    targetCgpa = getTargetCgpa(env, object, currentCgpa);
    // calculate the gpa to get in this trimester in order to get the target
cgpa
    gpaToGet = calculateGpaToGet(currentCgpa, completedCredit,
currentCredit, targetCgpa);

    // display to result
    printf("You should get a GPA of %.2f to raise your CGPA to %.2f",
gpaToGet, targetCgpa);
}
```

Question 2

ArrayGenerate.java

```
import java.util.Scanner;
import java.io.IOException;

class ArrayGenerate{
  private native void arrayGenerator(int length);
  private native int arrayMinMaxDiff(int[] arrayNumber);
  private native void arrayMiscellaneous(int[] arrayNumber);
  private int arrayNum[];

  // To clear the terminal
  public static void clearScreen(){
    try {
      new ProcessBuilder("cmd", "/c", "cls").inheritIO().start().waitFor();
    }
    catch (InterruptedException | IOException e) {
      e.printStackTrace();
    }
  }

  // Header line for the CLI program
  private void displayTitle(){
    // clear the terminal
    ArrayGenerate.clearScreen();

    System.out.println("Array Generation");
    System.out.println("-----------------------------------------------------
");
  }

  // get user input as length for array
  private int inputArrayLength(Scanner scanner){
    int length;
    boolean error;

    do{
      error = false;

      // get user input as length
      System.out.print("Size of array to generate: ");
      try{
        length = Integer.parseInt(scanner.nextLine());
      }
      // if user input is not a number
      catch(NumberFormatException e){
        length = 0;
```

```
      }

      // if the length is not valid, ask the user to re-enter again, until a
valid input is inserted
      if(length < 1){
        System.out.println();
        System.out.println("Invalid input! Size of array must be equal or
larger than 1");
        error = true;
      }
    } while(error);

    return length;
  }

  public static void main(String[] args){
    int arrayLength;
    int diff;
    ArrayGenerate arrayGenerate = new ArrayGenerate();

    Scanner scanner = new Scanner(System.in);
    // display the header line
    arrayGenerate.displayTitle();
    // get the length of the array from user
    arrayLength = arrayGenerate.inputArrayLength(scanner);
    // avoid resource leak
    scanner.close();

    // generate the array with random numbers
    arrayGenerate.arrayNum = new int[arrayLength];
    arrayGenerate.arrayGenerator(arrayLength);

    // calculate the different between the largest and smallest number
    diff = arrayGenerate.arrayMinMaxDiff(arrayGenerate.arrayNum);
    System.out.println("The difference between min and max number is " +
diff + ".");
    System.out.println();

    // extra features for the array
    arrayGenerate.arrayMiscellaneous(arrayGenerate.arrayNum);
  }
  static{
    System.loadLibrary("ArrayGenerator");
    System.loadLibrary("ArrayMinMaxDiff");
    System.loadLibrary("ArrayMiscellaneous");
  }
}
```

ArrayGenerator.c

```c
#include <stdio.h>
#include <jni.h>
#include <stdlib.h>
#include <stdbool.h>
#include <time.h>

// generate the array with random number [1-100] with given length
void GenerateArray(jint *theArray, int length){
  bool numLessThan50 = false;

  printf("Numbers less than 50 in the array: ");

  for(int i = 0; i < length; i++){
    // generate the random numbers
    // (rand() % (MAX - MIN + 1)) + MIN
    theArray[i] = (rand() % (100 - 1 + 1)) + 1;

    // display the numbers that are less than 50
    if(theArray[i] < 50){
      numLessThan50 = true;
      printf("%ld ", theArray[i]);
    }
  }

  // if no number less than 50
  if(!numLessThan50){
    printf("not found");
  }

  printf("\n");
}

JNIEXPORT void JNICALL Java_ArrayGenerate_arrayGenerator(JNIEnv *env,
jobject object, jint length){
  jint randomNumber[length];

  // Use current time as seed for random generator
  srand(time(0));

  // generate the array
  GenerateArray(randomNumber, length);

  // link with java class, to get java array field
  jclass clazz = (*env)->GetObjectClass(env, object);
  jfieldID fid = (*env)->GetFieldID(env, clazz, "arrayNum", "[I");
  jintArray javaArray = (*env)->GetObjectField(env, object, fid);
```

```
  // copy the native array to java array
  (*env)->SetIntArrayRegion(env, javaArray, 0, length, randomNumber);
}
```

ArrayMinMaxDiff.c

```
#include <stdio.h>
#include <jni.h>
#include <math.h>

int findMaxNumber(jint theArray[], int length){
  int max;
  int index;
  int counter;

  max = theArray[0];
  index = 0;
  counter = 1;

  for (int i = 1; i < length; i++) {
    if (theArray[i] > max) {
       index = i;
       counter = 1;
       max = theArray[i];
    }
    else if(theArray[i] == max){
      counter++;
    }
  }

  printf("The Maximum is %d, at Index %d, Occurs %d times\n", max, index,
counter);

  return max;
}

int findMinNumber(jint theArray[], int length){
  int min;
  int index;
  int counter;

  min = theArray[0];
  index = 0;
  counter = 1;

  for (int i = 1; i < length; i++) {
    if (theArray[i] < min) {
       index = i;
```

```
        counter = 1;
        min = theArray[i];
    }
    else if(theArray[i] == min){
      counter++;
    }
  }

  printf("The Minimum is %d, at Index %d, Occurs %d times\n", min, index,
counter);

  return min;
}

JNIEXPORT int JNICALL Java_ArrayGenerate_arrayMinMaxDiff(JNIEnv *env,
jobject object, jintArray numArray){
  int max;
  int min;

  // link the java array field, and get the array
  jsize len = (*env)->GetArrayLength(env, numArray);
  jint *numArr = (*env)->GetIntArrayElements(env, numArray, NULL);

  max = findMaxNumber(numArr, len);
  min = findMinNumber(numArr, len);

  (*env)->ReleaseIntArrayElements(env, numArray, numArr, JNI_ABORT);

  return max - min;
}
```

ArrayMiscellaneous.c

```
#include <stdio.h>
#include <jni.h>

void showAllNumber(jint numArr[], int len){
  printf("All number in the array: ");

  for(int i = 0; i < len; i++){
    printf("%ld ", numArr[i]);
  }

  printf("\n");
}

void sortTheNumber(jint numArr[], int len){
  int temp;
```

```
  for(int i = 0; i < len; i++){
    for(int j = i + 1; j < len; j++){
      if(numArr[i] > numArr[j]){
        temp = numArr[i];
        numArr[i] = numArr[j];
        numArr[j] =temp;
      }
    }
  }

  printf("After sort: ");
  for(int i = 0; i < len; i++){
    printf("%ld ", numArr[i]);
  }

  printf("\n");
}

void calculateTotalMean(jint numArr[], int len){
  int total = 0;

  for(int i = 0; i < len; i++){
    total += numArr[i];
  }

  printf("Total of the array is %d\n", total);
  printf("Mean of the array is %.2f\n", (float)total / (float)len);
}

JNIEXPORT void JNICALL Java_ArrayGenerate_arrayMiscellaneous(JNIEnv *env,
jobject object, jintArray numArray){
  // link the java array field, and get the array
  jsize len = (*env)->GetArrayLength(env, numArray);
  jint *numArr = (*env)->GetIntArrayElements(env, numArray, NULL);

  showAllNumber(numArr, len);
  sortTheNumber(numArr, len);
  calculateTotalMean(numArr, len);

  (*env)->ReleaseIntArrayElements(env, numArray, numArr, JNI_ABORT);
}
```

2.2 Print Screen of Outputs

Question 1

Error! Reference source not found. shows the output of the ClassifyHonours.java. The program will first ask user to select their qualification, before asking for the CGPA. The program will then use these two data to calculate the classification of honours for the users. The classification of honours for diploma and degree is based on the Table 1 and Table 2 respectively.

After calculated the classification, the program will prompt user if they wish to continue to calculate the GPA will achieve to get the target CGPA. If user proceed, the program will request the user's completed credit hours, current taking credit hours, and target CGPA to get for this trimester. After getting this information, the program will then calculate the GPA to get in this trimester in order to achieve the target CGPA.

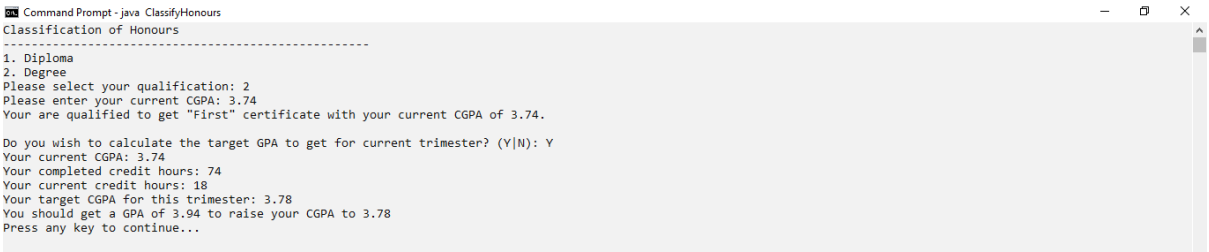


Figure 5 Output for ClassifyHonours.java

Table 1 Diploma Classification of Honours

Classification of Honours	CGPA
Distinction	3.50 – 4.00
Credit	3.00 – 3.49
Pass	2.00 – 2.99

Table 2 Degree CLassification of Honours

Classification of Honours	CGPA
First	3.67 – 4.00
Second Upper	3.33 – 3.66
Second Lower	2.67 – 3.32
Third	2.00 – 2.66

Question 2

Figure 6 shows the output for the ArrayGenerate.java. Once the program starts, it will ask the user to enter the size of the array to generate. After that, an array with the size of the input will be fill with random numbers. If any of the elements in the array is less than 50, it will be displayed to the user. Besides that, it will find the maximum number and minimum number in the array, and find the index of its first occurrence, as well as the number of times that the numbers appear in the array. Hereafter, it will calculate the difference between maximum number and minimum number.

In additions, the program will also show all the elements in the array and then sort it accordingly. It will also calculate the sum of all elements in the array, as well as its mean number.

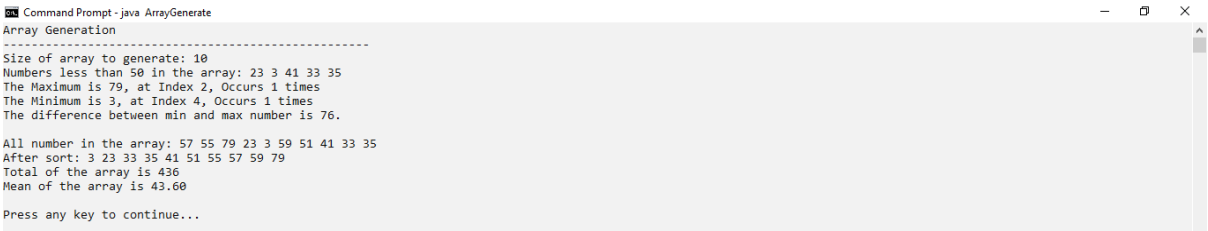


Figure 6 Output for ArrayGenerate.java