**Assignment No.: 3**

**Problem Statement:**

Design a library management system with the following databases :

Book(book\_id, book\_name, title, author, subject, availability, price)

Borrower(brwr\_id, brwr\_name, city, phone)

Borrows(book\_id, brwr\_id, do\_issue, do\_return)

Create the above relations through SQL commands specifying the integrity constraints. Insert at least six tuples in each table such that the following queries yield some results :

1. Find all books which have not been borrowed in February 2015
2. Find the total number of times, the costliest book on ‘Computer Science’ has been borrowed.
3. Find all borrowers living in ‘Kolkata’ who have borrowed at least one book on ‘Mathematics’.

Create an user interface for the above application. Perform the following in your interface design :

1. Input, view, modify and delete ‘Book’ and ‘Borrows’ table in separate forms.
2. Design a form for issuing books. Use combo boxes to accept ‘book\_id’ and ‘brwr\_id’, include routines to ensure that a borrower can buy books only when it is available.
3. Design a form for returning of books. Change availability of books when a book is issued or returned.
4. In the ‘Return’ form, put a command button with caption ‘Calculate fine’, on clicking which, the fine is displayed in a message box. Fine is charges according to the following rule :

A book must be returned within 14 days from the date of issue. Henceforth, Rs. 1.5/day is charged.

**SQL Operations:**

**Table Book**

**Creation:**

SQL> create table book (

2 book\_id varchar2(5) primary key,

3 book\_name varchar2(50),

4 title varchar2(50),

5 author varchar2(50),

6 subject varchar2(50),

7 availability number,

8 price number

9 );

Table created.

**Description:**

SQL> desc book;

Name Null? Type

----------------------------------------- -------- ----------------------------

BOOK\_ID NOT NULL VARCHAR2(5)

BOOK\_NAME VARCHAR2(50)

TITLE VARCHAR2(50)

AUTHOR VARCHAR2(50)

SUBJECT VARCHAR2(50)

AVAILABILITY NUMBER

PRICE NUMBER

**Insertion:**

SQL> insert into book values ('bk1', 'Fundamentals of Data Structure', 'Data Structure', 'Debasis

Samanta', 'Computer Science', 5, 200);

1 row created.

SQL> insert into book values ('bk2', 'Fundamentals of Operating System', 'Operating System', 'Peter

Galvin', 'Computer Science', 5, 400);

1 row created.

SQL> insert into book values ('bk3', 'Linear Programming Problems', 'LPP', 'Narendra Singh',

'Mathematics', 5, 100);

1 row created.

SQL> insert into book values ('bk4', 'Let Us C', 'C Language', 'Yashawant Kanetkar', 'Compu

ter Science', 3, 200);

1 row created.

SQL> insert into book values ('bk5', 'System Programming', 'System Software', 'John J. Donovan'

, 'Computer Science', 2, 150);

1 row created.

SQL> insert into book values ('bk6', 'Modern Algebra', 'Higher Algebra', 'Pallab Mukherjee',

'Mathematics', 2, 300);

1 row created.

**Table Borrower**

**Creation:**

SQL> create table borrower (

2 brwr\_id varchar2(5) primary key,

3 brwr\_name varchar2(50),

4 city varchar2(50),

5 phone number(10)

6 );

Table created.

**Description:**

SQL> desc borrower;

Name Null? Type

----------------------------------------- -------- ----------------------------

BRWR\_ID NOT NULL VARCHAR2(5)

BRWR\_NAME VARCHAR2(50)

CITY VARCHAR2(50)

PHONE NUMBER(10)

**Insertion:**

SQL> insert into borrower values ('br1', 'John', 'Kolkata', 5738573713);

1 row created.

SQL> insert into borrower values ('br2', 'Scully', 'Delhi', 9837263647);

1 row created.

SQL> insert into borrower values ('br3', 'Neil', 'Mumbai', 8472727174);

1 row created.

SQL> insert into borrower values ('br4', 'Patrick', 'Kolkata', 6472636472);

1 row created.

SQL> insert into borrower values ('br5', 'Amanda', 'Kolkata', 9572535163);

1 row created.

SQL> insert into borrower values ('br6', 'Roger', 'Bangalore', 8473623642);

1 row created.

**Table Borrows**

**Creation:**

SQL> create table borrows (

2 book\_id varchar2(5) references book on delete cascade,

3 brwr\_id varchar2(5) references borrower on delete cascade,

4 do\_issue date,

5 do\_return date,

6 primary key (book\_id, brwr\_id)

7 );

Table created.

SQL> desc borrows;

Name Null? Type

----------------------------------------- -------- ----------------------------

BOOK\_ID NOT NULL VARCHAR2(5)

BRWR\_ID NOT NULL VARCHAR2(5)

DO\_ISSUE DATE

DO\_RETURN DATE

**Insertion:**

SQL> insert into borrows values ('bk1', 'br1', '09-feb-2015', '19-feb-2015');

1 row created.

SQL> insert into borrows values ('bk5', 'br2', '10-feb-2015', '11-feb-2015');

1 row created.

SQL> insert into borrows values ('bk2', 'br6', '11-feb-2015', '22-feb-2015');

1 row created.

SQL> insert into borrows values ('bk2', 'br3', '11-feb-2015', '22-feb-2015');

1 row created.

SQL> insert into borrows values ('bk3', 'br4', '15-feb-2015', '26-feb-2015');

1 row created.

SQL> insert into borrows values ('bk3', 'br5', '15-feb-2015', '26-feb-2015');

1 row created.

SQL> insert into borrows values ('bk4', 'br2', '10-mar-2015', '22-mar-2015');

1 row created.

SQL> insert into borrows values ('bk6', 'br2', '15-mar-2015', '26-mar-2015');

1 row created.

SQL> insert into borrows values ('bk6', 'br5', '15-mar-2015', '26-mar-2015');

1 row created.

SQL> select \* from borrows;

BOOK\_ BRWR\_ DO\_ISSUE DO\_RETURN

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bk1 br1 09-FEB-15 19-FEB-15

bk5 br2 10-FEB-15 11-FEB-15

bk2 br6 11-FEB-15 22-FEB-15

bk2 br3 11-FEB-15 22-FEB-15

bk3 br4 15-FEB-15 26-FEB-15

bk3 br5 15-FEB-15 26-FEB-15

bk4 br2 10-MAR-15 22-MAR-15

bk6 br2 15-MAR-15 26-MAR-15

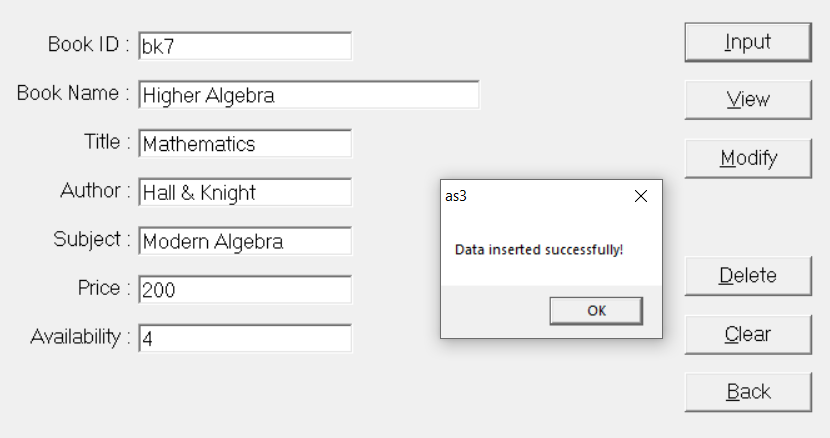
bk6 br5 15-MAR-15 26-MAR-15

9 rows selected.

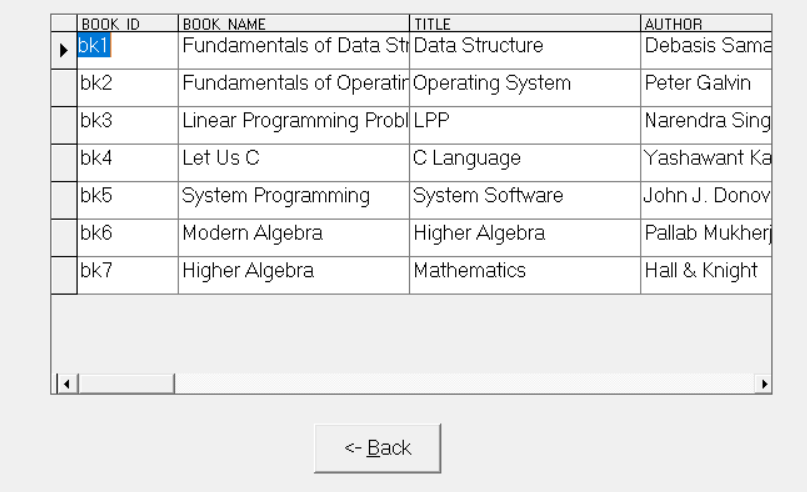
**Visual Basic Operations:**

**Table Book forms**

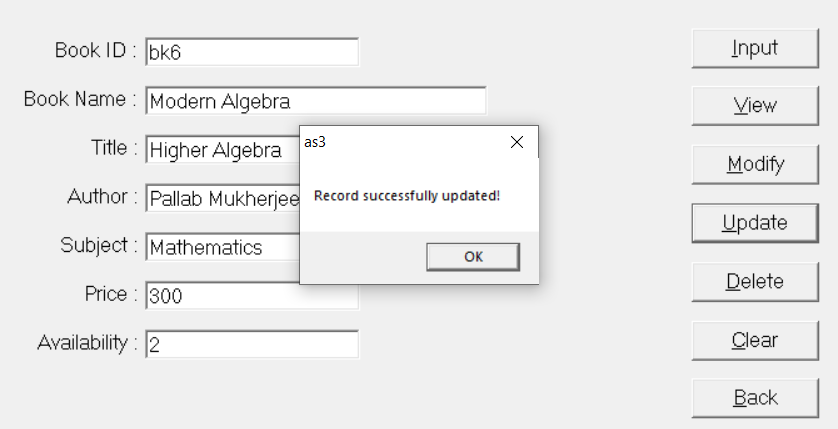
**Insertion:**

****

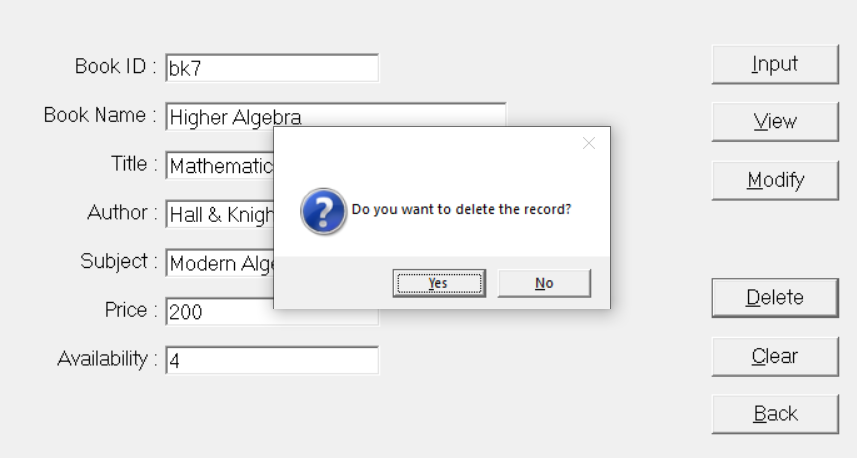
**View:**

****

**Modification:**

****

**Deletion:**

****

**Book form code**

**Variable Declaration:**

Dim cn As ADODB.Connection, cmd As ADODB.Command

Dim s As String

Dim rs As ADODB.Recordset

**Back Button:**

Private Sub btn\_back\_Click()

Unload Me

Form5.Show

End Sub

**Clear Button:**

Private Sub btn\_clear\_Click()

tb\_author.Text = ""

tb\_availability.Text = ""

tb\_bid.Text = ""

tb\_bname.Text = ""

tb\_price.Text = ""

tb\_subject.Text = ""

tb\_title.Text = ""

End Sub

**Delete Button:**

Private Sub btn\_delete\_Click()

Dim id As String

id = InputBox("Enter book ID to delete : ")

rs.MoveFirst

rs.Find "book\_id like '" & id & "'"

If (rs.EOF = True) Then

MsgBox "No such record found!"

Else

tb\_author = rs("author")

tb\_availability = CStr(rs("availability"))

tb\_bid = id

tb\_bname = rs("book\_name")

tb\_price = CStr(rs("price"))

tb\_subject = rs("subject")

tb\_title = rs("title")

If MsgBox("Do you want to delete the record?", vbQuestion + vbYesNo, App.ProductName) = vbYes Then

rs.Delete adAffectCurrent

End If

End If

btn\_clear\_Click

End Sub

**Input Button:**

Private Sub btn\_input\_Click()

rs.MoveFirst

If isValid = False Then

tb\_bid.SetFocus

Else

If tb\_price.Text = "" Then

tb\_price.Text = 0

End If

If tb\_availability.Text = "" Then

tb\_availability.Text = 0

End If

s = "insert into book values ('" + tb\_bid.Text + "', '" + tb\_bname.Text + "', '" + tb\_title.Text + "', '" + tb\_author.Text + "', '" + tb\_subject.Text + "', " + tb\_availability.Text + ", " + tb\_price.Text + ")"

cmd.ActiveConnection = cn

cmd.CommandText = s

cmd.Execute

MsgBox "Data inserted successfully!"

End If

End Sub

**Modify Button:**

Private Sub btn\_modify\_Click()

Dim id As String

id = InputBox("Insert book ID : ")

rs.MoveFirst

rs.Find "book\_id like '" & id & "'"

If rs.EOF = True Then

MsgBox "No such record found!"

Else

tb\_author.Text = rs("author")

tb\_availability.Text = CStr(rs("availability"))

tb\_bid.Text = id

tb\_bname.Text = rs("book\_name")

tb\_price.Text = CStr(rs("price"))

tb\_subject.Text = rs("subject")

tb\_title.Text = rs("title")

btn\_update.Visible = True

End If

End Sub

**Update Button:**

Private Sub btn\_update\_Click()

rs("author") = tb\_author.Text

rs("availability") = Val(tb\_availability.Text)

rs("book\_id") = tb\_bid.Text

rs("book\_name") = tb\_bname.Text

rs("price") = Val(tb\_price.Text)

rs("subject") = tb\_subject.Text

rs("title") = tb\_title.Text

rs.Update

MsgBox "Record successfully updated!"

btn\_update.Visible = False

End Sub

**View Button:**

Private Sub btn\_view\_Click()

Unload Me

Form2.Show

End Sub

**For connecting to the database on load:**

Private Sub Form\_Load()

Set cn = New ADODB.Connection

Set cmd = New ADODB.Command

Set rs = New ADODB.Recordset

cn.Open "PROVIDER=OraOLEDB.Oracle;User ID=system;Persist Security Info=False", "system", "system"

rs.Open "select \* from book", cn, adOpenDynamic, adLockOptimistic

End Sub

**Checking whether the given book ID is valid:**

Private Function isValid() As Boolean

If (Len(tb\_bid.Text)) = 0 Then

MsgBox ("Book ID cannot be blank!")

isValid = False

tb\_bid.SetFocus

Else

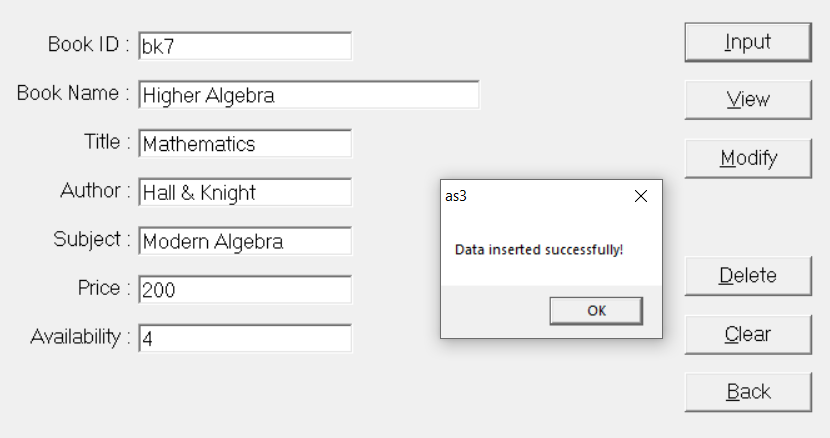
isValid = True

End If

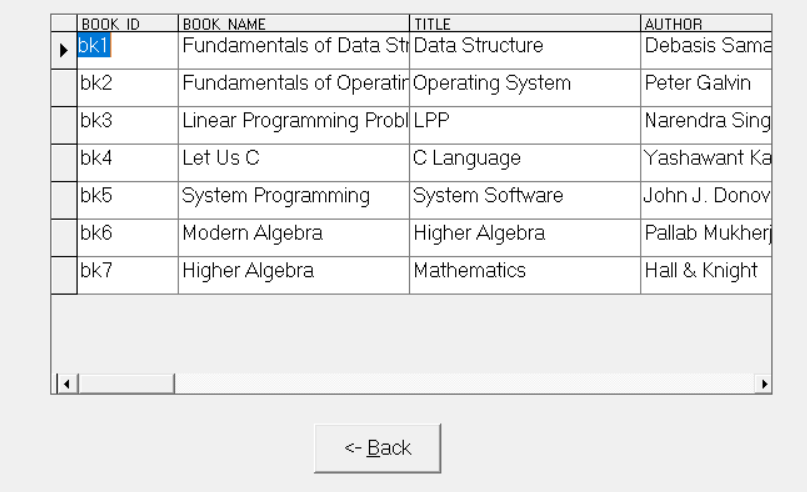
End Function

**Table Borrower forms**

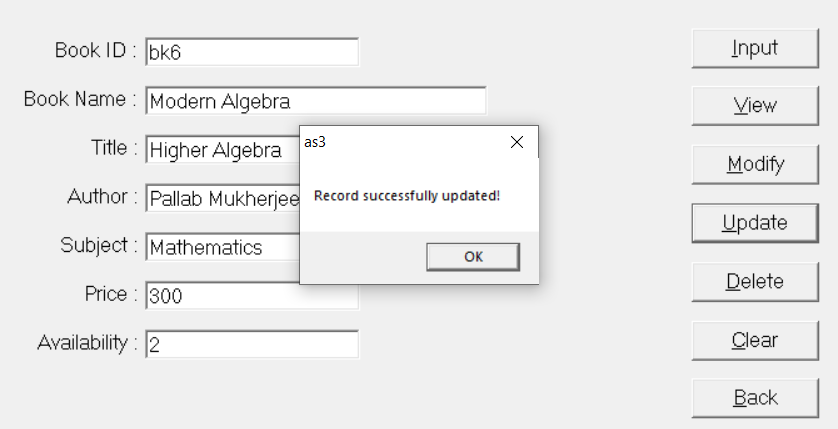
**Insertion:**

****

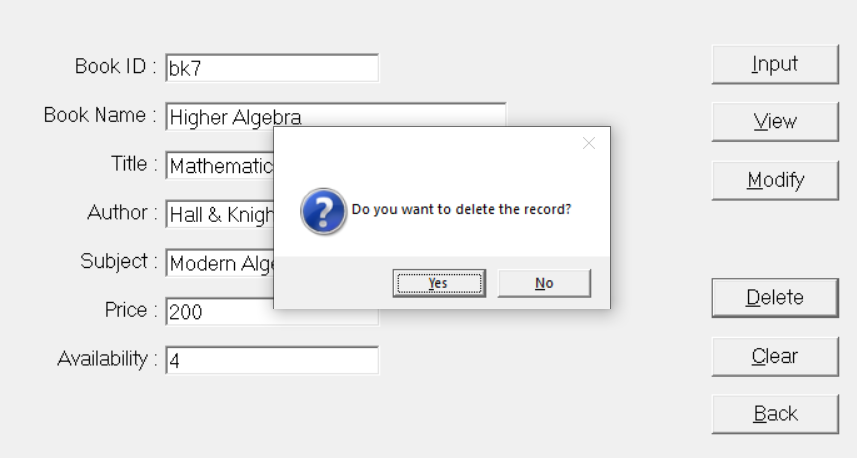
**View :**

****

**Modification:**

****

**Deletion :**



**Borrower form code**

**Variable Declaration:**

Dim cn As ADODB.Connection, cmd As ADODB.Command

Dim s As String

Dim rs As ADODB.Recordset

**Back Button:**

Private Sub btn\_back\_Click()

Unload Me

Form5.Show

End Sub

**Clear Button:**

Private Sub btn\_clear\_Click()

tb\_bid.Text = ""

tb\_bname.Text = ""

tb\_city.Text = ""

tb\_phone.Text = ""

End Sub

**Delete Button:**

Private Sub btn\_delete\_Click()

Dim id As String

id = InputBox("Enter borrower ID to delete : ")

rs.MoveFirst

rs.Find "brwr\_id like '" & id & "'"

If (rs.EOF = True) Then

MsgBox "No such record found!"

Else

tb\_phone.Text = CStr(rs("phone"))

tb\_bid.Text = id

tb\_bname.Text = rs("brwr\_name")

tb\_city.Text = rs("city")

If MsgBox("Do you want to delete the record?", vbQuestion + vbYesNo, App.ProductName) = vbYes Then

rs.Delete adAffectCurrent

MsgBox "Record deleted successfully!"

End If

End If

btn\_clear\_Click

End Sub

**Input Button:**

Private Sub btn\_input\_Click()

rs.MoveFirst

If isValid = False Then

tb\_bid.SetFocus

Else

If tb\_phone.Text = "" Then

tb\_phone.Text = 0

End If

s = "insert into borrower values ('" + tb\_bid.Text + "', '" + tb\_bname.Text + "', '" + tb\_city.Text + "', " + tb\_phone.Text + ")"

cmd.ActiveConnection = cn

cmd.CommandText = s

cmd.Execute

rs.Resync

MsgBox "Data inserted successfully!"

End If

End Sub

**Modify Button:**

Private Sub btn\_modify\_Click()

Dim id As String

id = InputBox("Insert borrower ID : ")

rs.MoveFirst

rs.Find "brwr\_id like '" & id & "'"

If rs.EOF = True Then

MsgBox "No such record found!"

btn\_update.Visible = False

Else

tb\_phone.Text = CStr(rs("phone"))

tb\_bid.Text = id

tb\_city.Text = rs("city")

tb\_bname = rs("brwr\_name")

btn\_update.Visible = True

End If

End Sub

**Update Button:**

Private Sub btn\_update\_Click()

rs("brwr\_id") = tb\_bid.Text

rs("brwr\_name") = tb\_bname.Text

rs("phone") = Val(tb\_phone.Text)

rs("city") = tb\_city.Text

rs.Update

MsgBox "Record successfully updated!"

btn\_update.Visible = False

End Sub

**View Button:**

Private Sub btn\_view\_Click()

Unload Me

Form4.Show

End Sub

**For connection to the database of load:**

Private Sub Form\_Load()

Set cn = New ADODB.Connection

Set cmd = New ADODB.Command

Set rs = New ADODB.Recordset

cn.Open "PROVIDER=OraOLEDB.Oracle;User ID=system;Persist Security Info=False", "system", "system"

rs.Open "select \* from borrower", cn, adOpenDynamic, adLockOptimistic

End Sub

**Checking whether given book ID is valid:**

Private Function isValid() As Boolean

If (Len(tb\_bid.Text)) = 0 Then

MsgBox ("Book ID cannot be blank!")

isValid = False

tb\_bid.SetFocus

Else

isValid = True

End If

End Function

**Checking whether a phone number is valid:**

Private Sub tb\_phone\_KeyPress(KeyAscii As Integer)

If (KeyAscii >= Asc("0") And KeyAscii <= Asc("9")) Or KeyAscii = 8 Then

KeyAscii = KeyAscii

Else

MsgBox "Phone number can only contain digits!"

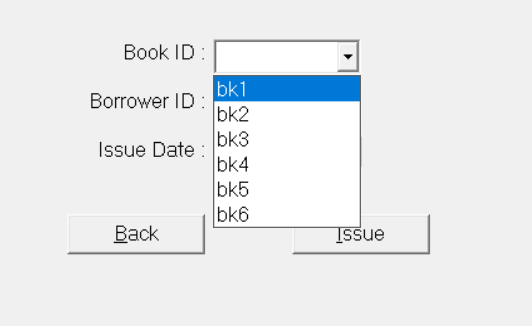
KeyAscii = 0

End If

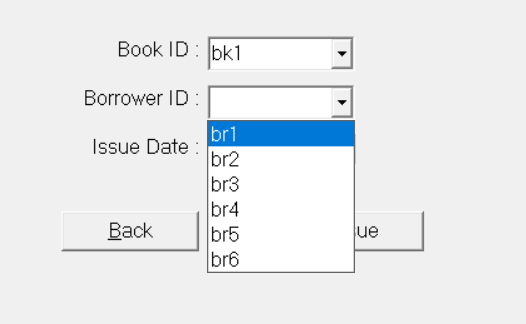
End Sub

**Table Borrows forms**

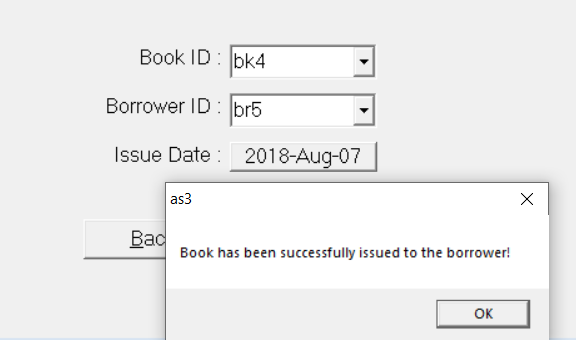
**Use of combo box to accept book ID:**



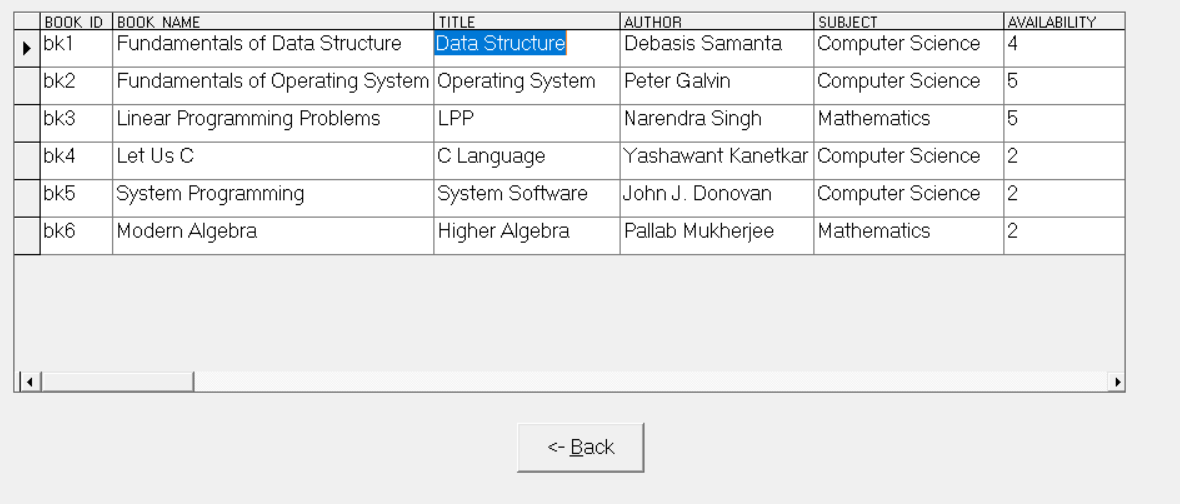
**Use of combo box to accept borrower ID:**



**Issuing of books:**



**Changing of availability:**



**Issue form code**

**Variable Declaration:**

Dim cn As ADODB.Connection, cmd As ADODB.Command

Dim s As String

Dim rs1, rs2 As ADODB.Recordset

**Back Button:**

Private Sub btn\_back\_Click()

Unload Me

Form5.Show

End Sub

**Date Button:**

Private Sub btn\_date\_Click()

Calendar1.Visible = True

btn\_date.Visible = False

btn\_issue.Visible = False

End Sub

**Issue Button:**

Private Sub btn\_issue\_Click()

Dim id1 As String

id1 = Format(Calendar1.Value, "YYYY-MM-DD")

s = "insert into borrows values ('" + cmb\_book\_id.Text + "', '" + cmb\_brwr\_id.Text + "', '" + id1 + "', NULL)"

cmd.ActiveConnection = cn

cmd.CommandText = s

cmd.Execute

Set rs1 = cn.Execute("update book set availability = availability - 1 where book\_id like '" + cmb\_book\_id.Text + "'")

MsgBox "Book has been successfully issued to the borrower!"

cmb\_book\_id.Text = ""

cmb\_brwr\_id.Text = ""

End Sub

**Calendar control:**

Private Sub Calendar1\_Click()

btn\_date.Caption = Format(Calendar1.Value, "YYYY-MMM-DD")

btn\_date.Visible = True

Calendar1.Visible = False

btn\_issue.Visible = True

End Sub

**Connecting to database on load:**

Private Sub Form\_Load()

Set cn = New ADODB.Connection

Set cmd = New ADODB.Command

Set rs1 = New ADODB.Recordset

Set rs2 = New ADODB.Recordset

cn.Open "PROVIDER=OraOLEDB.Oracle;User ID=scott;Persist Security Info=False", "scott", "tiger"

rs1.Open "select \* from book", cn, adOpenDynamic, adLockOptimistic

rs2.Open "select \* from borrows", cn, adOpenDynamic, adLockOptimistic

Set rs1 = cn.Execute("select \* from book where availability > 1")

Do While (rs1.EOF = False)

cmb\_book\_id.AddItem rs1("book\_id")

rs1.MoveNext

Loop

cmb\_book\_id.Text = ""

Set rs2 = cn.Execute("select \* from borrower")

Do While (rs2.EOF = False)

cmb\_brwr\_id.AddItem rs2("brwr\_id")

rs2.MoveNext

Loop

cmb\_brwr\_id.Text = ""

btn\_date.Caption = Format(Calendar1.Value, "DD-MMM-YY")

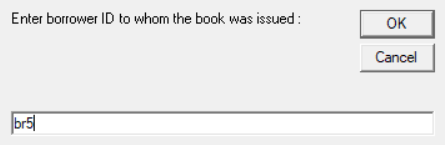
End Sub

**Table Borrowers forms**

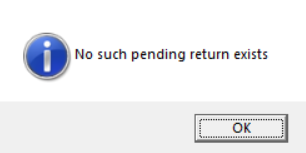
**Dialog to input book ID:**



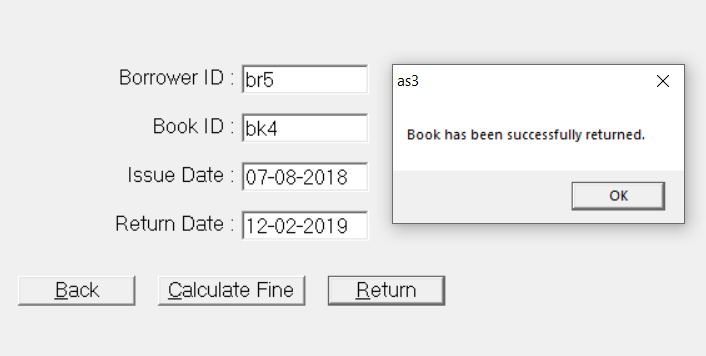
**Dialog to input borrower ID:**



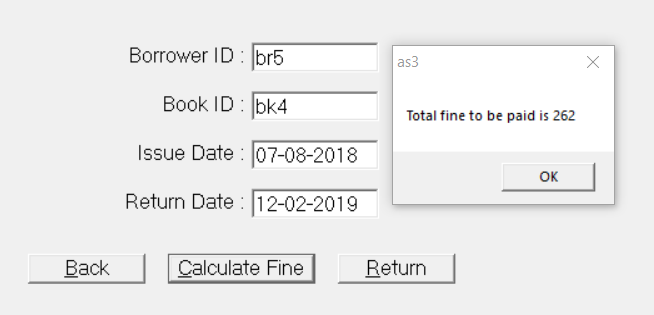
**Dialog when invalid borrower ID / book ID is entered:**



**Returning a book:**



**Calculating the fine:**

****

**Return form code**

**Declaration of variables:**

Dim cn As ADODB.Connection, cmd As ADODB.Command

Dim s, id1, id2 As String

Dim rs1 As ADODB.Recordset, rs2 As ADODB.Recordset

**Back Button:**

Private Sub btn\_back\_Click()

Unload Me

Form5.Show

End Sub

**Calculate fine Button:**

Private Sub btn\_cal\_fine\_Click()

Dim d As Long

Dim fine As Double

d = DateDiff("d", tb\_issue\_date.Text, tb\_return\_date.Text)

If d > 14 Then

d = d - 14

fine = d \* 1.5

MsgBox "Fine to be paid Rs. " + CStr(fine)

Else

MsgBox "No due fine to be paid!"

End If

End Sub

**Return Button:**

Private Sub btn\_ret\_Click()

rs2("do\_return") = CDate(tb\_return\_date.Text)

rs2.Update

rs1.Find "book\_id like '" + tb\_book\_id.Text + "'"

rs1("availability") = rs1("availability") + 1

rs1.Update

MsgBox "Book has been successfully returned!"

btn\_ret.Visible = False

btn\_cal\_fine.Visible = False

End Sub

**Connecting to the database on load:**

Private Sub Form\_Load()

id1 = InputBox("Enter book ID to return : ")

id2 = InputBox("Enter borrower ID to whom the book was issued : ")

Set cn = New ADODB.Connection

Set cmd = New ADODB.Command

Set rs1 = New ADODB.Recordset

Set rs2 = New ADODB.Recordset

rs2.CursorLocation = adUseClient

cn.Open "PROVIDER=OraOLEDB.Oracle;User ID=scott;Persist Security Info=False", "scott", "tiger"

' rs2.Open "select \* from borrows", cn, adOpenDynamic, adLockOptimistic

' rs2.MoveFirst

s = "select brwr\_id, book\_id, to\_char(do\_issue, 'DD-Mon-YYYY') as tcd, do\_return from borrows where brwr\_id like '" & id2 & "' and book\_id like '" & id1 & "' and do\_return is null"

' MsgBox s

' Set rs2 = cn.Execute(s)

' MsgBox rs2.RecordCount

' s = "brwr\_id like '" & id2 & "' and book\_id like '" & id1 & "' and do\_return is null"

'MsgBox s

rs2.Open s, cn, adOpenDynamic, adLockOptimistic

If (rs2.RecordCount = 0 Or rs2.RecordCount = -1) Then

MsgBox "No such pending return exists!", vbInformation

btn\_ret.Visible = False

btn\_cal\_fine.Visible = False

Else

'rs2.MoveFirst

'MsgBox rs2("do\_issue")

tb\_issue\_date.Text = rs2.Fields("tcd")

tb\_return\_date.Text = Format(Date, "DD-mmm-YYYY")

rs1.Open "select \* from book", cn, adOpenDynamic, adLockOptimistic

End If

tb\_book\_id.Text = id1

tb\_brwr\_id.Text = id2

End Sub

**Menu form**



**Menu form code**

**Books Button :**

Private Sub Command1\_Click()

Unload Me

Form1.Show

End Sub

**Borrowers Button :**

Private Sub Command2\_Click()

Unload Me

Form3.Show

End Sub

**Issue Button :**

Private Sub Command3\_Click()

Unload Me

Form6.Show

End Sub

**Return Button :**

Private Sub Command4\_Click()

Unload Me

Form7.Show

End Sub

**SQL Queries**

1. **Find all books which have not been borrowed in February 2015**

SQL> select b.book\_id, b.title from book b where b.book\_id in (

2 select book\_id from borrows where do\_issue < '01-feb-2015' or do\_issue > '28-feb-2015' );

BOOK\_ TITLE

----- --------------------------------------------------

bk4 C Language

bk6 Higher Algebra

1. **Find total number of times the costliest book on “Computer Science” have been borrowed**

SQL> select count(book\_id) from borrows where book\_id in (

2 select book\_id from book where price in (

3 select max(price) from book

4 )

5 );

COUNT(BOOK\_ID)

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2

1. **Find all borrowers living in ‘Kolkata’ who have borrowed at least one book in ‘Mathematics’**

SQL> select brwr\_name from borrower where city = 'Kolkata' and brwr\_id in (

2 select brwr\_id from borrows where book\_id in (

3 select book\_id from book where subject = 'Mathematics'

4 )

5 );

BRWR\_NAME

--------------------------------------------------

Patrick

Amanda