Date-

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 :

i) Find all books which have not been borrowed in February 2015
ii) Find the total number of times, the costliest book on 'Computer Science' has been borrowed.
iii) 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 :

i) Input, view, modify and delete 'Book' and 'Borrows' table in separate forms.
ii) 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.
iii) Design a form for returning of books. Change availability of books when a book is issued or returned.
iv) 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.
```

Date-

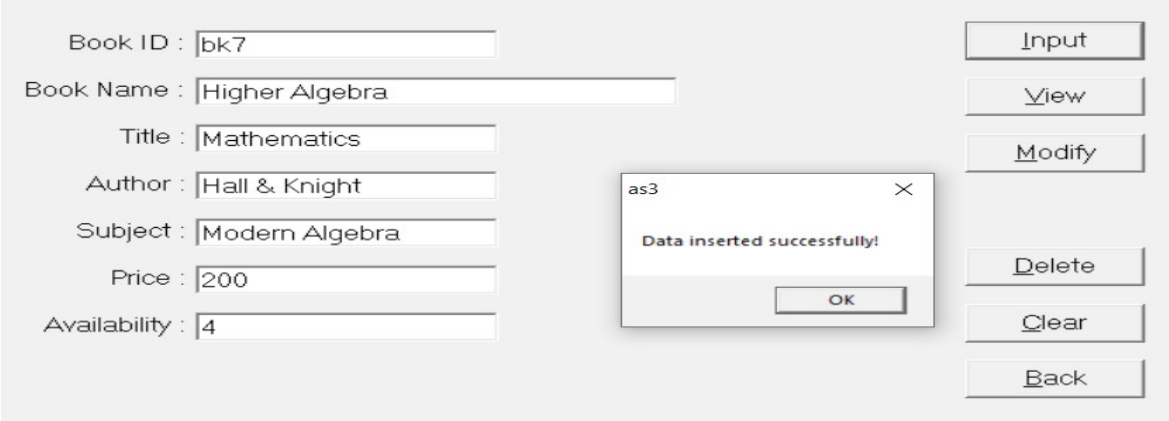
```
SQL> insert into borrows values ('bk4', 'br2', '10-mar-2015', '22-mar-2015');
1 row created.

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
----- ----- --------- ---------
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.
```

Date-

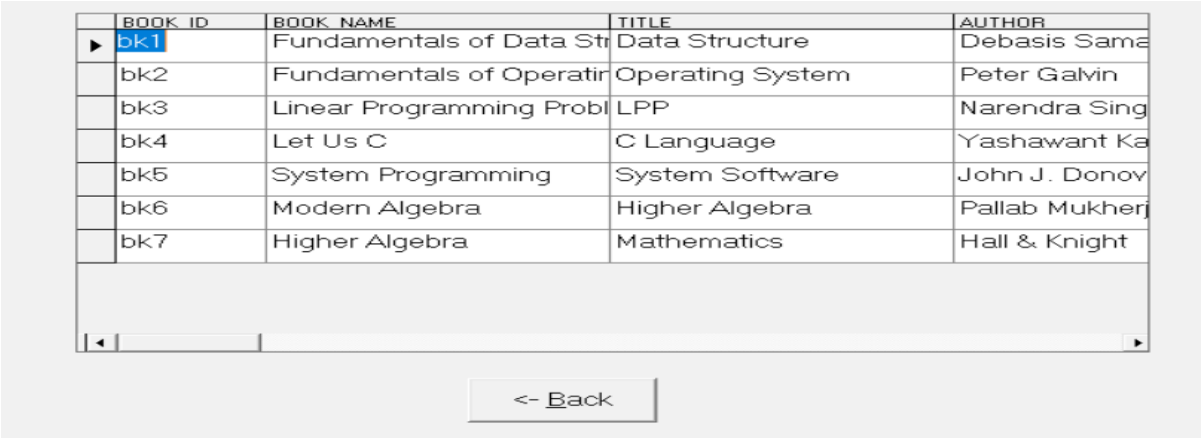
Visual Basic Operations:

Table Book forms

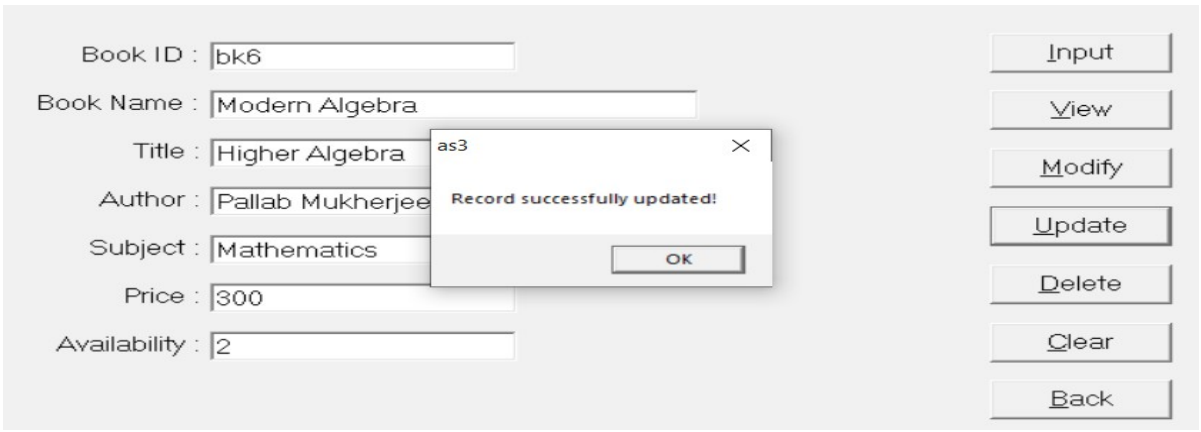
Insertion:



View:

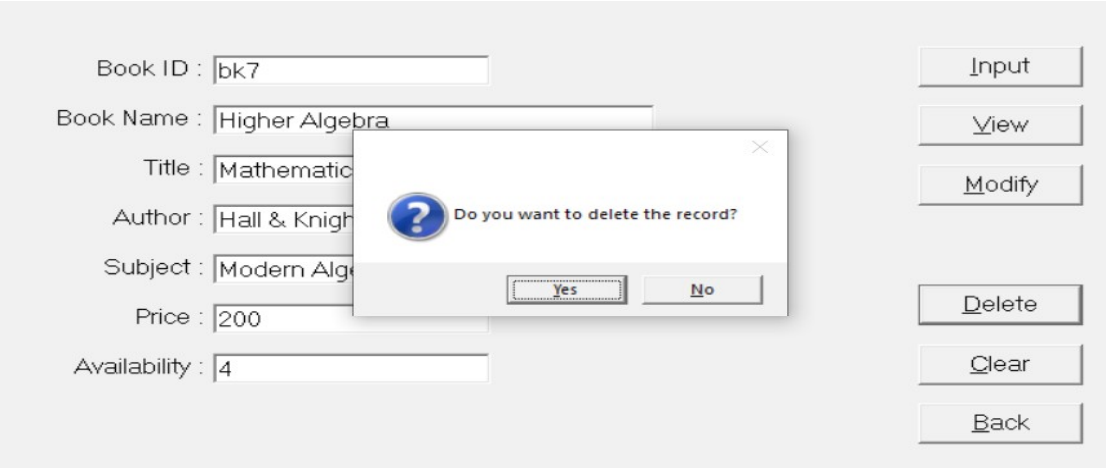


Modification:



Date-

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
```

Date-

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
```

Date-

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
```

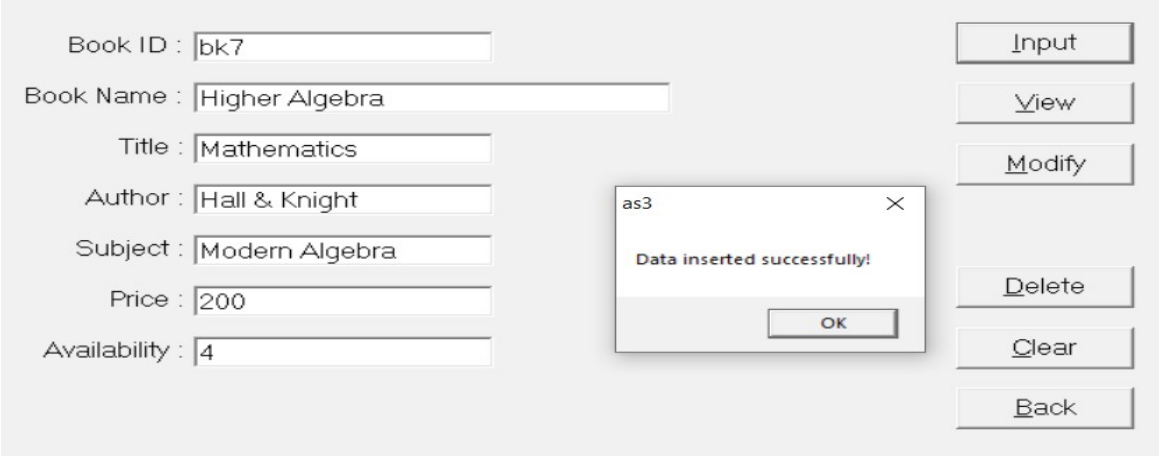
Checking whether the given book ID is valid:

```
Private Function isValid() As Boolean
   If (Len(tb_bid.Text)) = 0 Then
```

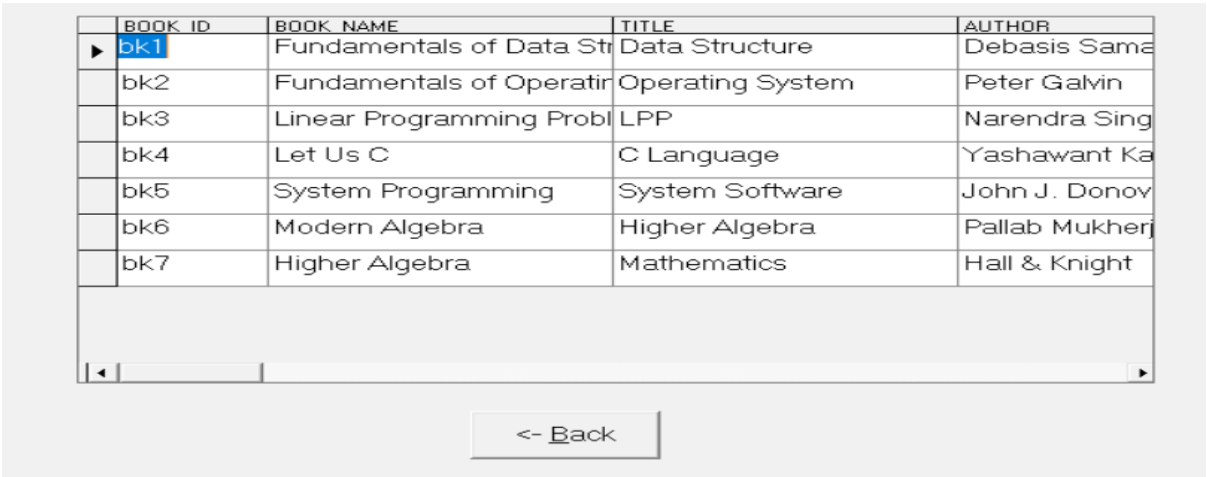
```
        MsgBox ("Book ID cannot be blank!")
        isValid = False
        tb_bid.SetFocus
    Else
        isValid = True
    End If
End Function
```

Table Borrower forms

Insertion:

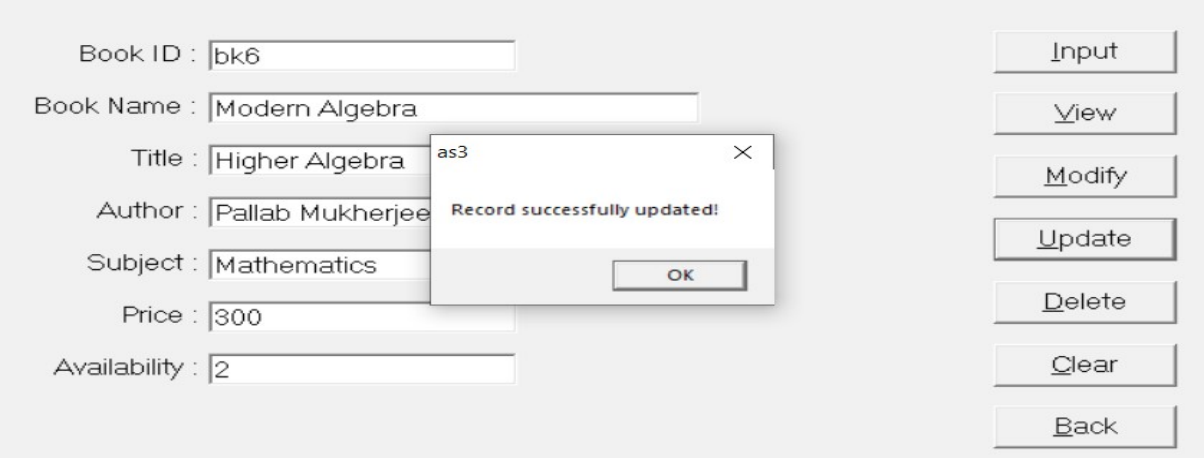


View :

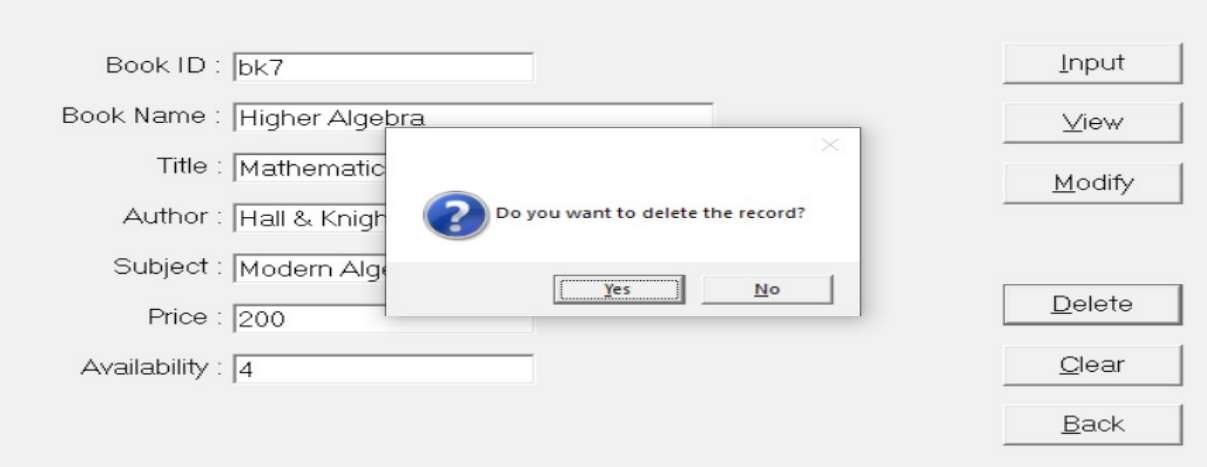


Date-

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!")
```

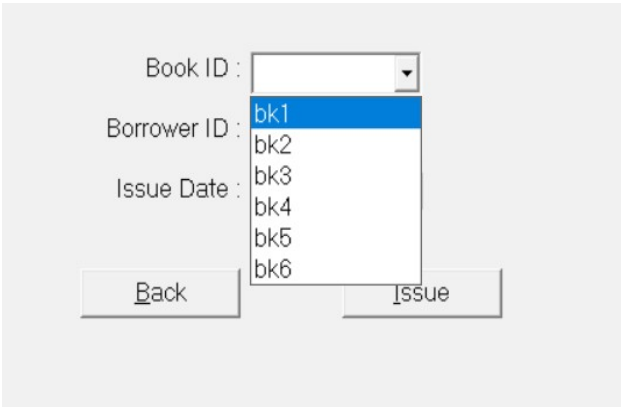
```
        isValid = False
        tb_bid.SetFocus
    Else
        isValid = True
    End If
End Function
```

Checking whether a phone number is valid:

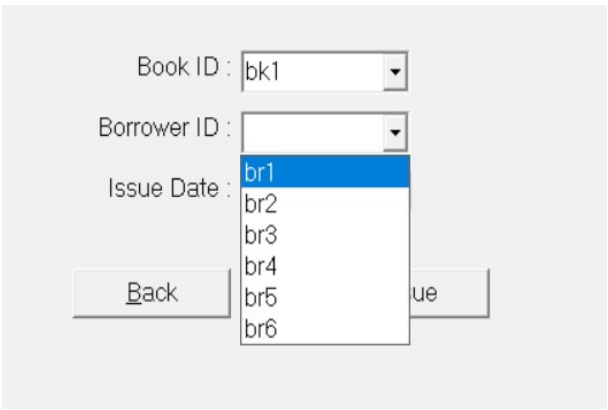
```
Private Sub tb_phone_KeyPress(KeyAscii As Integer)
    If (KeyAscii >= Asc("0") And KeyAscii <= Asc("9")) Or KeyAscii = 8 Then
        KeyAscii = KeyAscii
    Else
        MsgBox "Phone number can only contain digits!"
        KeyAscii = 0
    End If
End Sub
```

Table Borrows forms

Use of combo box to accept book ID:

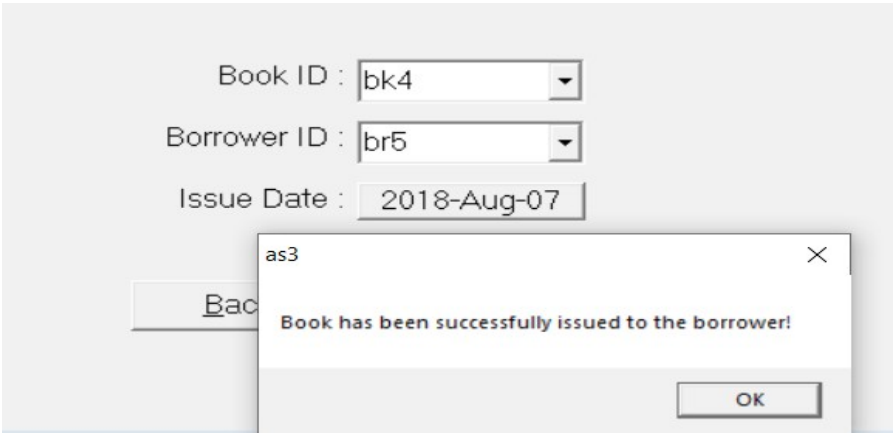


Use of combo box to accept borrower ID:

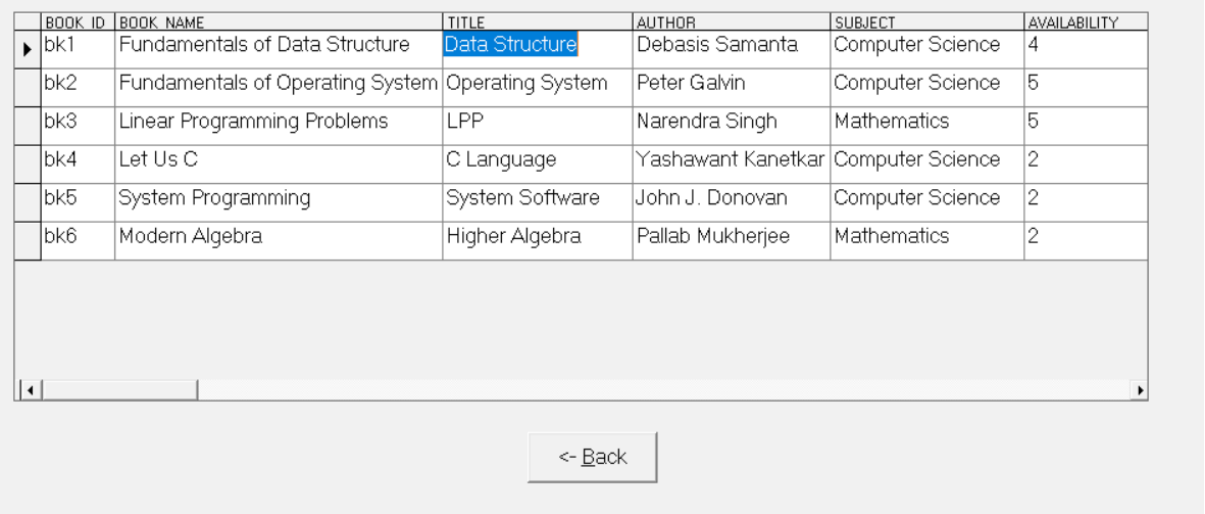


Date-

Issuing of books:



Changing of availability:



BOOK_ID	BOOK_NAME	TITLE	AUTHOR	SUBJECT	AVAILABILITY
bk1	Fundamentals of Data Structure	Data Structure	Debasis Samanta	Computer Science	4
bk2	Fundamentals of Operating System	Operating System	Peter Galvin	Computer Science	5
bk3	Linear Programming Problems	LPP	Narendra Singh	Mathematics	5
bk4	Let Us C	C Language	Yashawant Kanetkar	Computer Science	2
bk5	System Programming	System Software	John J. Donovan	Computer Science	2
bk6	Modern Algebra	Higher Algebra	Pallab Mukherjee	Mathematics	2

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:

Date-

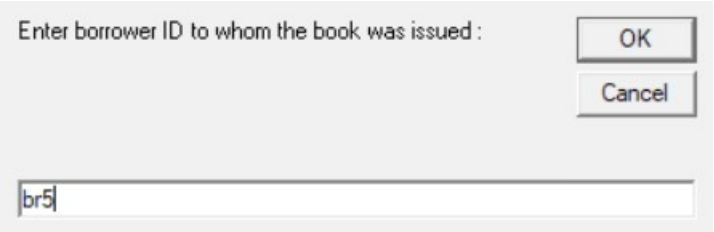
```
Private Sub Form_Load()
   Set cn = New ADODB.Connection
   Set cmd = New ADODB.Command
   Set rs1 = New ADODB.Recordset
   Set rs2 = New ADODB.Recordset
    cn.Open "PROVIDER=OraOLEDB.Oracle;User ID=scott;Persist Security Info=False", "scott",
"tiger"
   rs1.Open "select * from book", cn, adOpenDynamic, 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

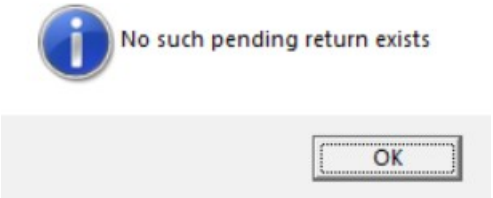
Dialog to input book ID:

Date-

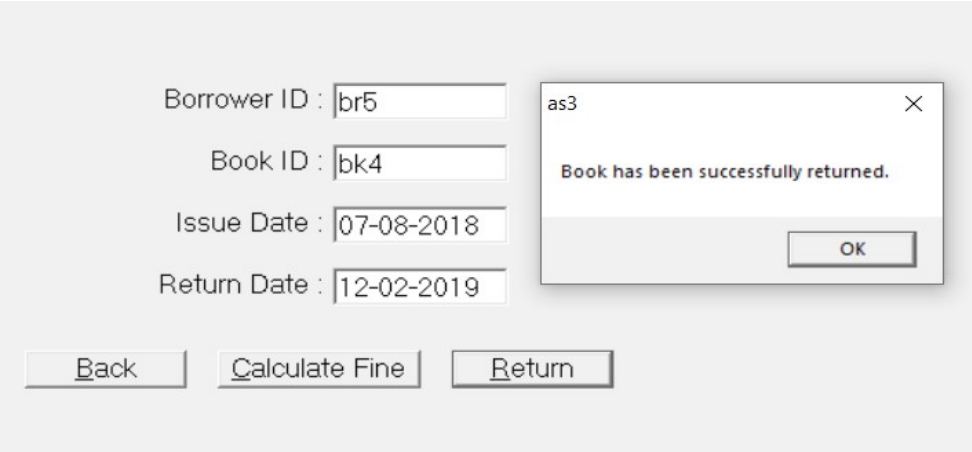
Dialog to input borrower ID:



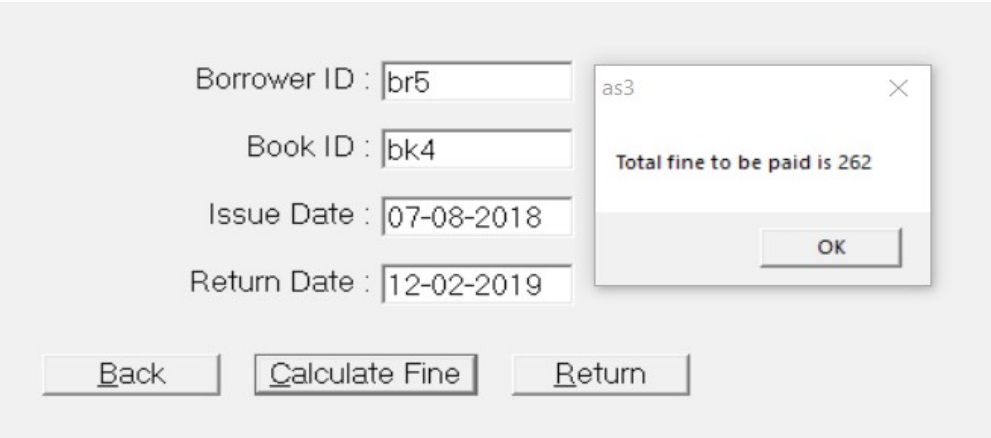
Dialog when invalid borrower ID / book ID is entered:



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
   ```

2. **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)
   --------------
              2
   ```

3. **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
   ```