

IBM Inter-University Programming Contest 2010 (Total Points: 1000)

Section 1: Multiple Choices (225 Points)

1.1. What is a portal? (15 Points)

- ☒ A. A portal provides site users with a single point of access to multiple types of information, delivering e-business applications over the Web to all kinds of client devices.
- ☐ B. A portal is a business email solution that empowers people with a single point of access to people, business applications, and resources across the enterprise and the Internet.
- ☐ C. A portal is a highly productive application development environment that supports the rapid development and deployment of collaborative or workflow-driven business applications that are scalable and security-rich.
- ☐ D. A portal is a suite of business productivity software creating, editing, and sharing word processing documents, spreadsheets, and presentations.

N/A 1.2. A portal represents a comprehensive approach to delivering Web-supported tools and enabling services to employees, customers and business partners. Services enabled by portal include (15 Points):

- ☒ I. Authentication/authorization
- ☒ II. Content management
- ☒ III. Collaboration
- ☒ IV. Personalization

- ☐ A. I, II
- ☐ B. I, II, IV
- ☐ C. I, III, IV
- ☒ D. I, II, III, IV

1.3. What is a portlet? (15 Points)

- ☐ A. A portlet defines the number of content areas within a portal page.
- ☒ B. A portlet is an application that displays page content and is the base building block of a portal.
- ☐ C. A portlet represents the overall look and feel of the portal, including colors, images and fonts.
- ☐ D. A portlet is a set of permissions that determines who has authority to manage a page and control whether others who have authority to edit the page can move, edit or delete the content areas on the page.

~~1.4.~~

Which of the following is NOT part of LDAP standard (15 Points):

- A. Information Model
- ☒ B. Replication Model
- C. Functional Model
- D. Security Model

D

1.5. Which of the following about IBM Tivoli Directory Server is NOT true (15 Points):

- A. Its proxy server architecture is designed for performance. ✓
- ☒ B. It uses DB2 as its data store.
- C. It supports multi-master replication. ✓
- ☒ D. It can be used as a replacement for a relational database.

1.6. The three LDAP object class types are (15 Points):

- A. Top, Structural, Auxiliary
- B. Abstract, Organizational, Auxiliary
- ☒ C. Abstract, Structural, Auxiliary
- D. Base, Abstract, Structural

1.7. What tools cannot be used to perform administration on DB2? (15 Points)

- A. Command Windows
- B. Control Center
- ☒ C. WebSphere Application Server
- D. Command Center

1.8. Which of the following is true regarding the architecture of DB2? (15 Points)

- A. Each server can have one instance only, and each instance can have multiple databases
- ☒ B. Each server can have multiple instances, and each instance can have multiple databases
- C. Each server can have one instance, and each instance can have one database only
- D. Each server can have multiple instances, and each instance can have one database only

1.9. What kind of applications can be implemented by relational database software such as DB2? (15 Points)

- ✓ I. Database Warehouse
- II. Pure Memory Database
- ✓ III. Online Transactional Processing System
- IV. Native XML Data Store

- ☒ A. I, III
- B. I, II, III
- C. I, III, IV
- D. All of the above

1.10. Which statement is NOT true using the Application Server's Administration Console such as WebSphere Application Server? (15 Points)

- A. An administrator can use Administration Console to install new application to Application Server. ✓
- B. An administrator can use Administration Console to configure JDBC database connections. ✓
- ☒ C. An administrator can use the Administration Console to develop J2EE application.
- D. An administrator can use the Administration Console to configure the application environment, such as variables, virtual hosts, etc. ✓

1.11. Which statement is TRUE about Application Server? (15 Points)

- A. Developers have to spend time writing code to make each application secure, scalable and reliable
- B. An Application Server doesn't provide a common environment and programming model for applications
- C. Applications written to comply with J2EE will not be run on an Application Server
- ☒ D. An Application Server provides the infrastructure for running the applications that run your business

1.12. What is the Application Server base topology for single machine that application server (single node) and web server are separated? (15 Points)

- ☒ A. The Web Server is resided in Demilitarized Zone (DMZ).
- B. The Web Server is not required in this topology.
- C. The Web Server is separated from Application Server, but both servers are resided in internal network. ✓
- D. Both of the Application Server and Web Server are resided in Demilitarized Zone (DMZ). ✗

1.13. Java Persistence API (JPA) uses _____ standard and object relational mapping (OR mapping) for data persistence among applications. (15 Points)

- A. DOJO toolkit
- B. SDO (Service Data Object)
- ☒ C. POJO (Plain Old Java Object)
- D. JSP (Java Server Pages)

1.14. What is the lifecycle of JSP and Servlet when a user initializes a request? (15 Points)

- A. JSP provides dynamic web content, and servlet provides static web content. JSP will be compiled into plain java class and loaded into runtime environment.
- B. JSP provides dynamic static content, and servlet provides dynamic web content. Servlet will be compiled in plain java class and loaded into runtime environment.
- C. JSP and servlet both provides dynamic web content. JSP and servlet will load directly into runtime environment.
- ☒ D. JSP and servlet both provides dynamic web content. JSP will be compiled into servlet class, and servlet class will be loaded into runtime environment.

1.15. What are the main capabilities of Integrated Development Environment (IDE)? (15 Points)

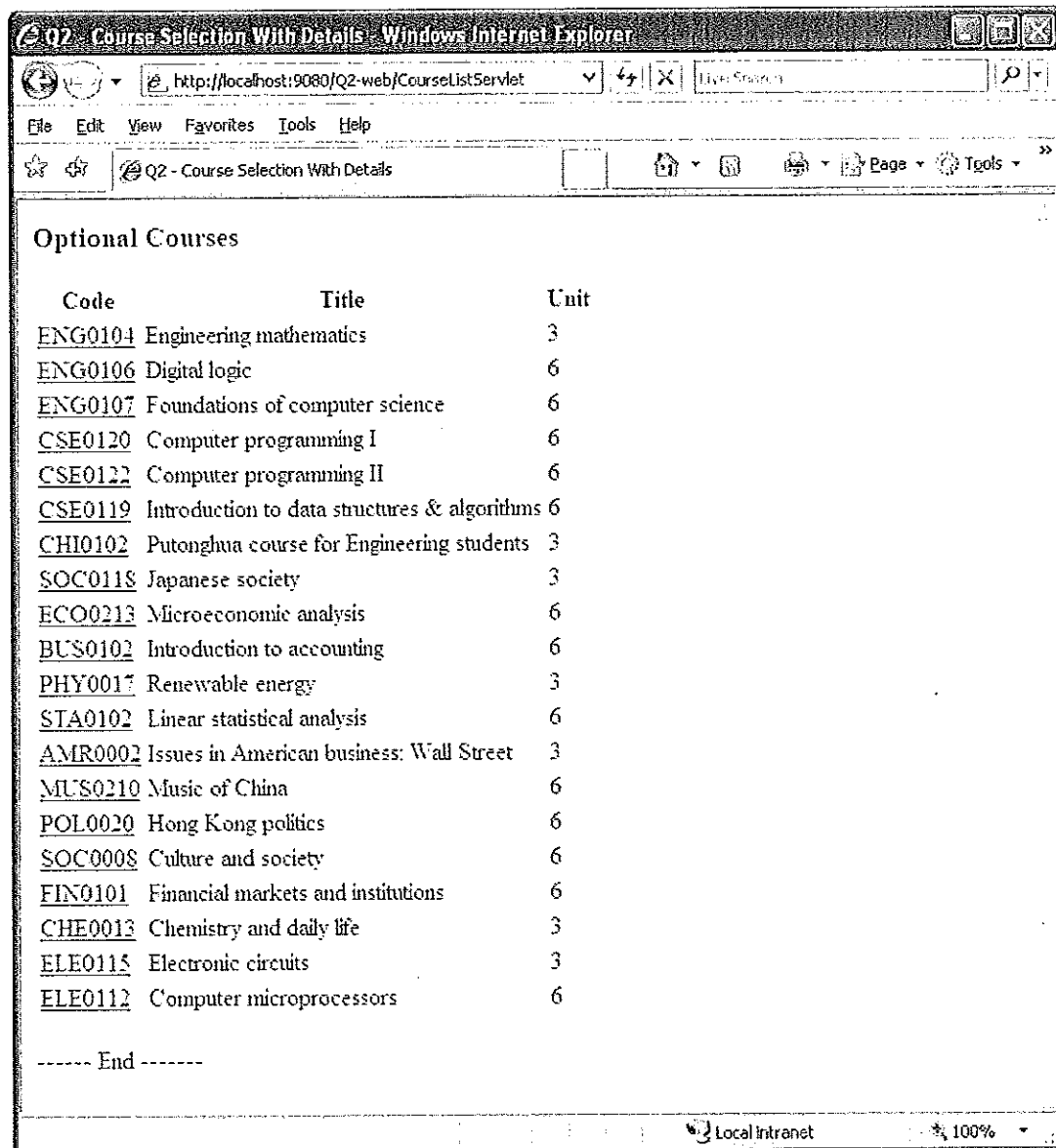
- ☒ I. Source code editor ✓
- ☒ II. Compiler and/or an interpreter ✓
- ☒ III. Project management
- ☒ IV. Build automation tools ✓
- ☒ V. Debugger or profiler ✓
- ☒ VI. Test management
- ☒ VII. Version control tool or adaptor

- A. I, II, VI, VII ✗
- B. I, II, IV, V, VII
- C. I, II, III, VI, VII ✗
- ☒ D. All of the above

2.2 Develop a Course List with Detailed Course Information (130 Points)

There exists a project Q2 in RAD. This is a copy of the project Q0 in the enablement training. The URL of the program is saved in "Favorites->Q2 – Course Selection with Details" in the Internet Explorer.

Using project Q2 as the template, change the programs such that an URL link is associated with each of the course code:



Q2 - Course Selection With Details - Windows Internet Explorer

http://localhost:9080/Q2-web/CourseListServlet

File Edit View Favorites Tools Help

Q2 - Course Selection With Details

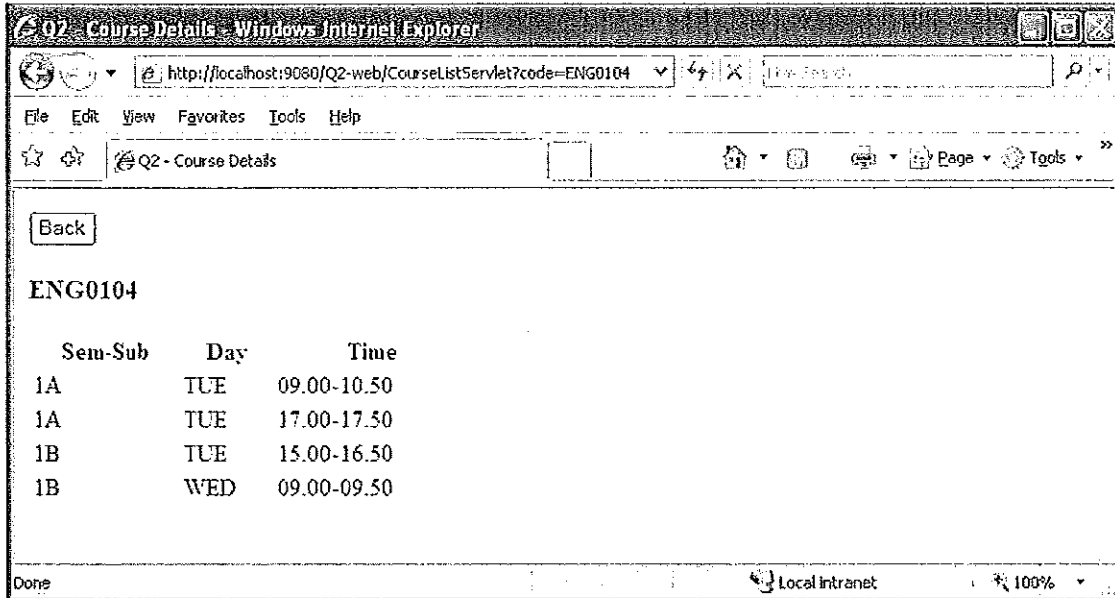
Optional Courses

Code	Title	Unit
ENG0104	Engineering mathematics	3
ENG0106	Digital logic	6
ENG0107	Foundations of computer science	6
CSE0120	Computer programming I	6
CSE0122	Computer programming II	6
CSE0119	Introduction to data structures & algorithms	6
CHI0102	Putonghua course for Engineering students	3
SOC0118	Japanese society	3
ECO0213	Microeconomic analysis	6
BUS0102	Introduction to accounting	6
PHY0017	Renewable energy	3
STA0102	Linear statistical analysis	6
AMR0002	Issues in American business: Wall Street	3
MUS0210	Music of China	6
POL0020	Hong Kong politics	6
SOC0008	Culture and society	6
FIN0101	Financial markets and institutions	6
CHE0013	Chemistry and daily life	3
ELE0115	Electronic circuits	3
ELE0112	Computer microprocessors	6

----- End -----

Local Intranet 100%

When an URL link is clicked, the following screen with course details should be produced (the course details information can be retrieved from the tables SUBCOURSE_TIME in the database SAMPLE):



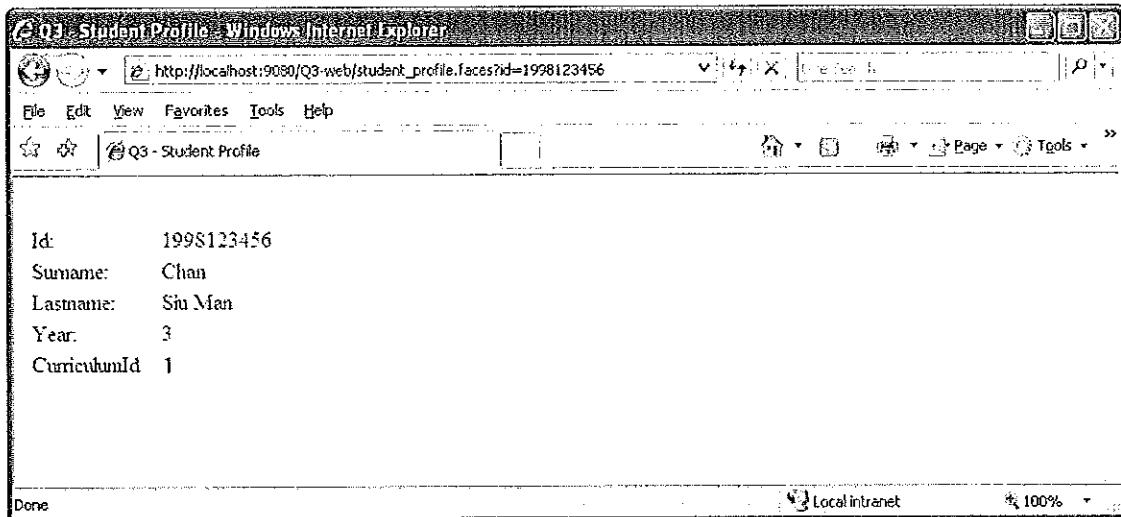
Hints:

- 1 The messages on the top of the above two windows (i.e., "Q2 - Course...") should be changed to the one displayed in the above two windows. Other messages must be the same as well. Otherwise, points will be deducted.
- 2 There is no need to change the URL in the Internet Explorer to the one displayed in the above windows. You might use the URL in the Favorites bookmark as the final URL to submit to the judge.
- 3 For the programming work, it is not necessary to change the class name to reflect to the output. For example, it is no need to change the file name from `CourseListServlet.java` to `CourseDetailServlet.java` in RAD. This applies to other programming objects such as variable names and file names.

① new Servlet (" ");
 ② SQL.
 select
 from

2.3 Student Profile (100 Points)

Use 'Q3-web' in RAD. By making use of the Page Designer feature in RAD, create the following screens that provide information of student profile:



The URL to produce this page should be

http://<server>:9080/Q3-web/student_profile.faces?id=1998123456 or
http://<server>:9080/Q3-web/student_profile.jsp?id=1998123456

where <server> is the name of your PC. Suppose you are in team1, the URL becomes

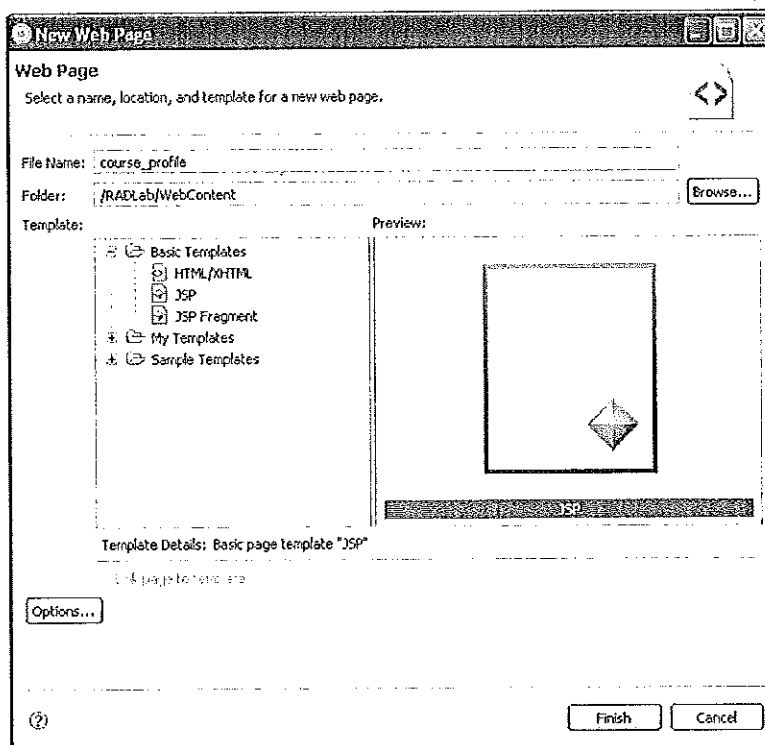
http://team1:9080/Q3-web/student_profile.faces?id=1998123456 or
http://team1:9080/Q3-web/student_profile.jsp?id=1998123456

Please note that there exists a parameter "id=<student id>" in the URL shown above. In the above case, <student id> is equal to 1998123456.

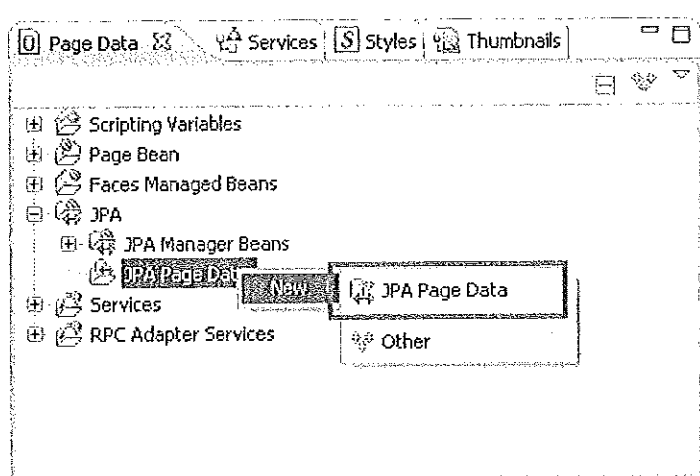
The student profile can be retrieved from table 'student' which has primary key of 'id' in DB2 'sample' database.

The following show major hints on how to implement the above screen quickly. As an illustration, the following steps create a similar screen that shows the course information. By repeating the below steps but choose the right table, the above screen can be implemented easily:

1. Please refer from step 10 to step 30 of lab 4 of the enablement training on 9th January 2010 to set up the Q3 project properly. These steps are to enable properties of "JavaServer Faces" in Properties > Project Facet such that the subsequent steps can be done correctly. (Note: In this step, you should configure student profile by selecting the table STUDENT rather than COURSE and FACULTY)
2. Create 'Course_profile.jsp' (Note: In this step, you should open student profile rather than course profile)



3. Create 'JPA Page Data' for 'Course_profile.jsp'



4. Click 'Create new JPA Manger' on the right side to create the StudentManager. Then click 'Retrieve a single record', get record by primary key, and the request parameter `#param.code`. Please remind to setup primary key for JPA.

Add JPA data to page

Select the JPA Manager bean to use in your page.
To add a new JPA Manager to your project click the Create New JPA Manager button.

Select a JPA Manager to use in your page:

- CourseManager
- FacultyManager

Create new JPA Manager...

Select how you would like to use your data

- ☐ Retrieve a list of data
- ☒ Retrieve a single record
- ☐ Create a new record
- ☐ Update an existing record

Next > Finish Cancel

Add JPA data to page

Select JPA Query

Select the method for the particular query to retrieve your desired data.

- ☒ Get record by primary key: findCourseByCode
- ☐ Get record from existing query:

getCourse
getCourseByCode
getCourseById
getCourseByTitle
getCourseByType
getCourseByYear

Add additional method...

Just a moment

< Back Next > Finish Cancel

Please make sure you see the primary key value is `#{param.id}`.

Add JPA data to page

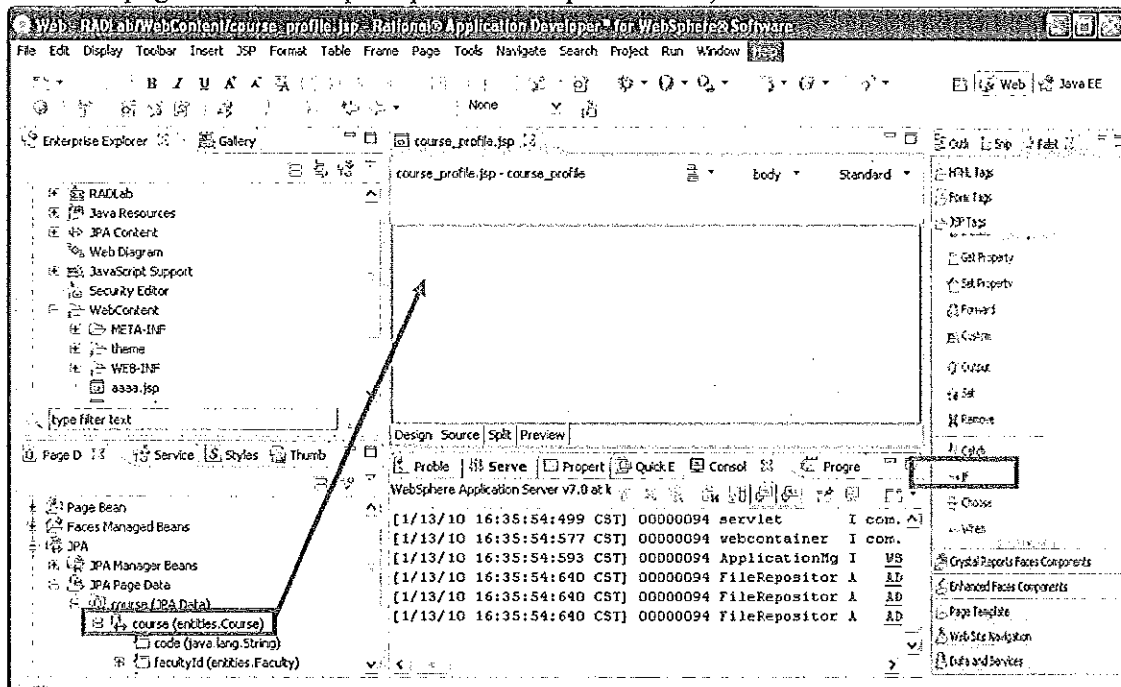
Set filter values
Set the values of the filter parameters that are part of the query.

Query Statement:
<find by primary key value>

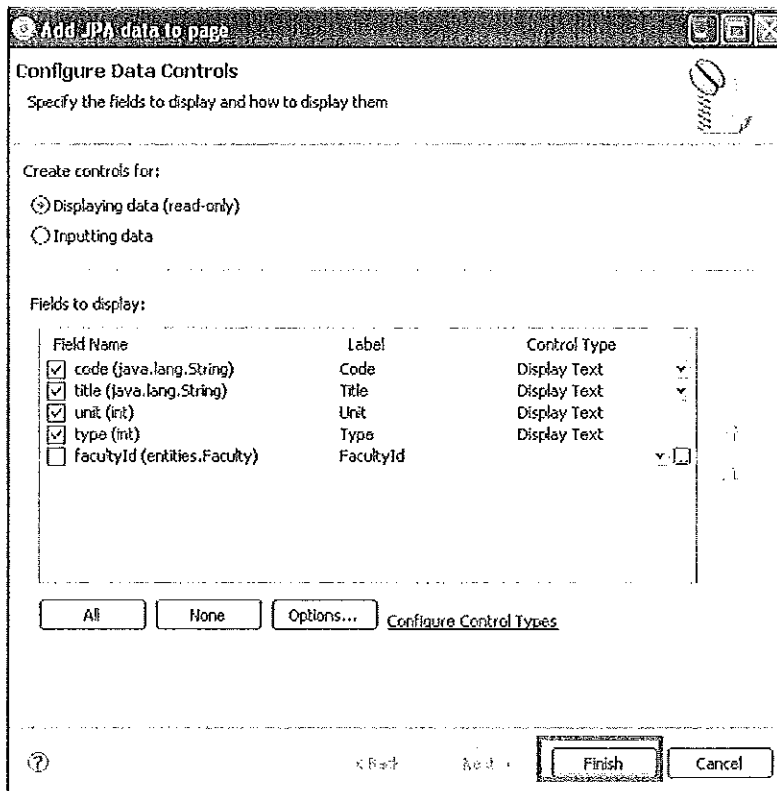
Primary Key	Primary Key Value
code	<code>#{param.code}</code>

< Back Finish Cancel

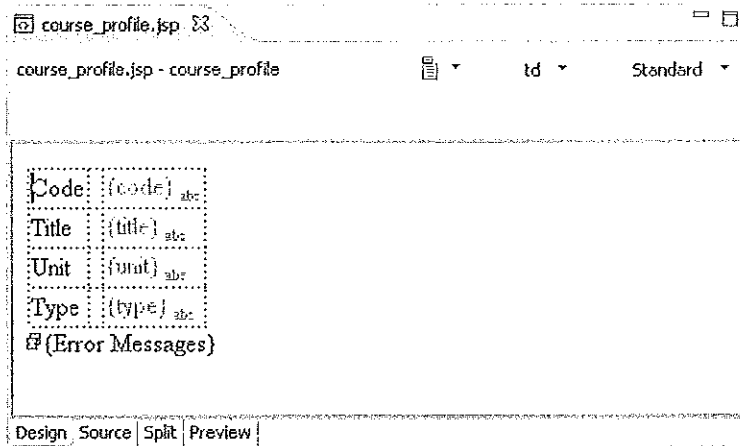
5. Drag and drop course(entities.Course) onto JSP page. (Advance tip: Add JSP Tags if-clause to page to handle request parameter equals to null)



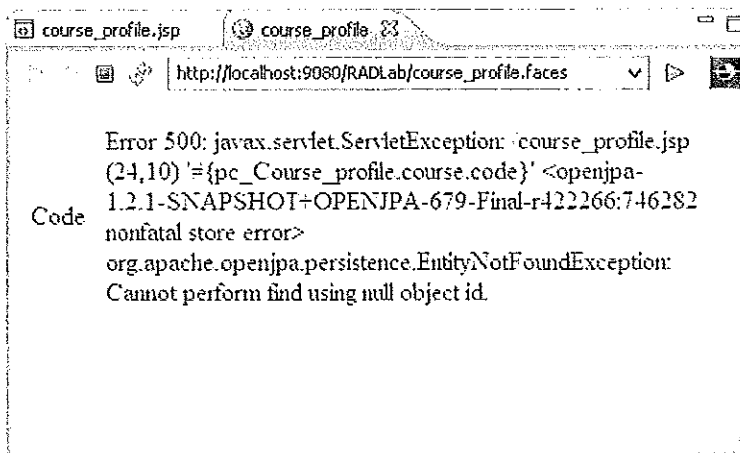
6. Confirm displaying data (read-only) with fields.




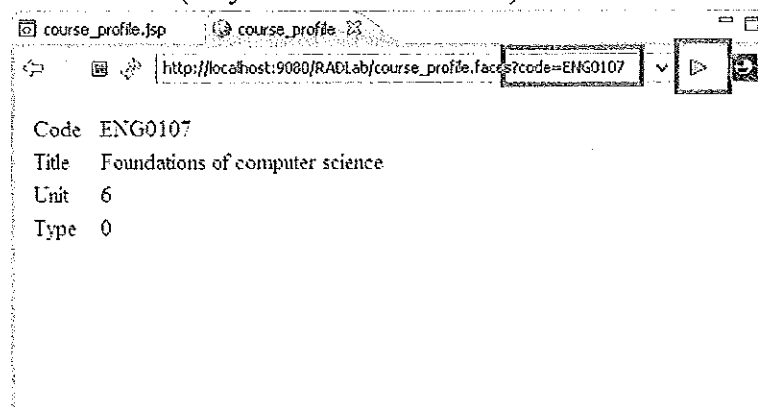
7. JSP page with fields will be generated. Save the changes, and run JSP on server.



8. Error when running the page because it requires parameter 'code' to get record by primary key.



9. You need to append ?code=ENG0107 (or ?id=XYZ) to the URL address and press  to reload (may need to refresh twice).



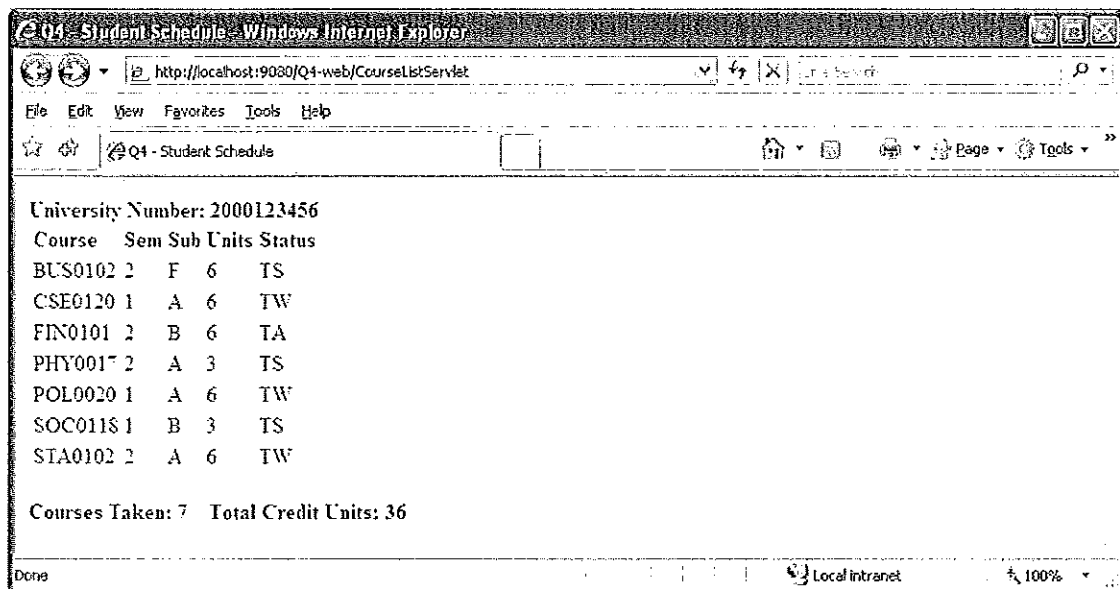
Hints:

- 1 The messages on the top of the above two windows (i.e., "Q3 – Student Profile...") should be changed to the one displayed in the above two windows. Other messages must be the same as well. Otherwise, points will be deducted.
- 2 The fastest method to complete this question is to use Page Designer provided by RAD. However, it is okay to use other programming method to produce the result as long as the output is the same as the above screens.

2.4 Student Schedule Report (120 Points)

There exists a project Q4 in RAD. This is a copy of the project Q0 in the enablement training. The URL of the program is saved in "Favorites->Q4 – Student Schedule" in the Internet Explorer.

Using project Q4 as the template, develop a student schedule report. The output of the report is shown below:



The screenshot shows a web browser window titled "Q4 - Student Schedule - Windows Internet Explorer". The address bar displays "http://localhost:9080/Q4-web/CourseListServlet". The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The address bar shows a star icon and the text "Q4 - Student Schedule". The main content area displays the following information:

University Number: 2000123456

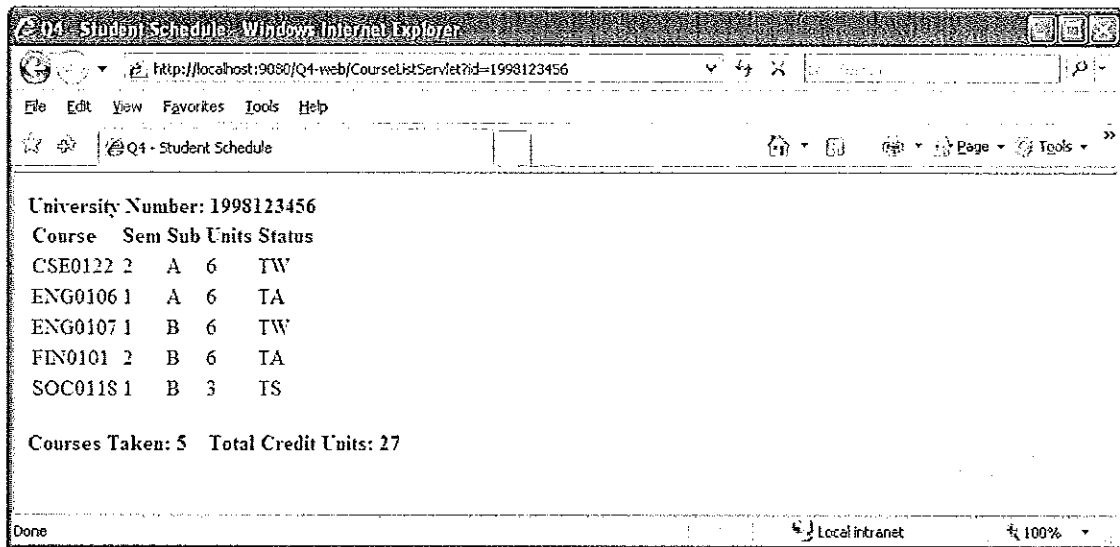
Course	Sem	Sub	Units	Status
BUS0102	2	F	6	TS
CSE0120	1	A	6	TW
FIN0101	2	B	6	TA
PHY0017	2	A	3	TS
POL0020	1	A	6	TW
SOC0118	1	B	3	TS
STA0102	2	A	6	TW

Courses Taken: 7 Total Credit Units: 36

The status bar at the bottom shows "Done", "Local intranet", and "100%" zoom.

The schedule related information can be obtained from the tables SCHEDULE and COURSE in the database SAMPLE. The list must be ordered by the columns "Course", "Sem" and "Sub".

By default, the student ID should be set to 2000123456. If an explicit parameter "id=<student id>" is added to the URL, the program should extract the schedule for the student with the provided student ID. Assuming the student ID is 1998123456, the following screen shows the expected output:



As shown in the above screen, a different schedule is displayed.

Hints:

- 1 The messages on the top of the above two windows (i.e., "Q4 – Student Schedule...") should be changed to the one displayed in the above two windows. Other messages must be the same as well. Otherwise, points will be deducted.
- 2 There is no need to change the URL in the Internet Explorer to the one displayed in the above window. You might use the URL in the Favorites bookmark as the final URL to submit to the judge.
- 3 For the programming work, it is not necessary to change the object name to reflect to the output. For example, it is no need to change the variable names to reflect to its actual usage.
- 4 For the programming work, it is not necessary to delete unused files and classes.

2.5 Student Schedule Report with Timetable (130 Points)

There exists a project Q5 in RAD. This is a copy of the project Q0 in the enablement training. The URL of the program is saved in "Favorites->Q5 –Student Schedule with Timetable" in the Internet Explorer.

Using project Q5 as the template, develop timetable report. The schedule can be retrieved from the tables 'SCHEDULE' and 'SUBCOURSE_TIME'. The output is shown below:

Q5 - Student Schedule with Timetable - Windows Internet Explorer

http://localhost:9080/Q5-web/CourseListServlet

File Edit View Favorites Tools Help

Q5 - Student Schedule with Timetable

University Number: 2000123456

Semester: 1

Time Day	Monday	Tuesday	Wednesday	Thursday	Friday
08:00					
09:00					
10:00		POL0020 A		CSE0120 A	
11:00		POL0020 A		CSE0120 A	
12:00		POL0020 A			
13:00					
14:00					CSE0120 A
15:00					CSE0120 A
16:00			SOC0118 B		
17:00					
18:00					

Semester: 2

Time Day	Monday	Tuesday	Wednesday	Thursday	Friday
08:00					
09:00					
10:00		BUS0102 F	PHY0017 A	BUS0102 F	
11:00		BUS0102 F			
12:00					
13:00	STA0102 A	FIN0101 B			
14:00		FIN0101 B			
15:00					
16:00					
17:00					
18:00					

Done Local intranet 100%

Similar to Q4, by default, the student ID should be set to 2000123456. If an explicit parameter "id=<student id>" is added to the URL, the program should extract the schedule for the student with the provided student ID. Assuming the student ID is 1998123456, the following screen shows the expected output:

Q5 - Student Schedule with Timetable - Windows Internet Explorer

http://localhost:9080/Q5-web/CourseListServlet?id=1998123456

File Edit View Favorites Tools Help

Q5 - Student Schedule with Timetable

University Number: 1998123456

Semester: 1

Time Day	Monday	Tuesday	Wednesday	Thursday	Friday
08:00					
09:00					
10:00					ENG0107 B
11:00			ENG0107 B		ENG0107 B
12:00					
13:00					
14:00	ENG0106 A				
15:00	ENG0106 A				
16:00			SOC0118 B		
17:00				ENG0106 A	
18:00					

Semester: 2

Time Day	Monday	Tuesday	Wednesday	Thursday	Friday
08:00					
09:00					
10:00					
11:00					
12:00					
13:00		FIN0101 B			
14:00		FIN0101 B			
15:00					
16:00	CSE0122 A				
17:00	CSE0122 A				CSE0122 A
18:00					

Done Local intranet 100%

As shown in the above screen, a different schedule is displayed.

Hints:

- 1 The messages on the top of the above two windows (i.e., "Q5 -Student Schedule with Timetable...") should be changed to the one displayed in the above two

- windows. Other messages must be the same as well. Otherwise, points will be deducted.
- 2 There is no need to change the URL in the Internet Explorer to the one displayed in the above window. You might use the URL in the Favorites bookmark as the final URL to submit to the judge.
 - 3 For the programming work, it is not necessary to change the object name to reflect to the output. For example, it is no need to change the variable names to reflect to its actual usage.
 - 4 For the programming work, it is not necessary to delete unused files and classes.

2.6 Create a Portal Page with Multiple Reports (100 Points)

Connect to the portal server through the provided URL stored in "Favorites->Q6 –IBM WebSphere Portal" in the Internet Explorer. Log into the Portal server using the provided username and password listed in Appendix A.

Construct a portal screen which consists of three portlets which show the schedule, optional courses and student information as shown in the following screen:

The screenshot shows the IBM WebSphere Portal interface. The top navigation bar includes links for 'WebSphere Portal', 'Applications', 'Search Center', and user information 't35admin | Edit My Profile | Help | Log Out'. Below the navigation bar, there are three portlets:

- Student Schedule**: Displays a table of courses for University Number: t35admin. The table has columns: Course, Sem, Sub, Unit, Status. Below the table, it shows 'Course Taken: 12' and 'Total Credit Units: 60'.
- Optional Courses**: Displays a table of optional courses. The table has columns: Code, Title, Unit. Below the table, it shows 'Student Information'.
- Student Information**: Displays a table with student details.

Course	Sem	Sub	Unit	Status
BUS0102	2	F	6	TS
CH0102	2	A	3	TA
CSE0119	2	B	6	TW
CSE0120	1	A	6	TW
CSE0122	2	A	6	TW
ECO0213	1	A	6	TW
ENG0104	1	A	3	TA
ENG0106	1	A	6	TA
ENG0105	1	B	6	TW
PHY0017	2	A	3	TS
SOC0115	1	B	3	TS
STA0102	2	A	6	TW

Course Taken: 12 Total Credit Units: 60

Code	Title	Unit
ENG0104	Engineering mathematics	3
ENG0106	Digital logic	6
ENG0107	Foundations of computer science	6
CSE0120	Computer programming I	6
CSE0122	Computer programming II	6
CSE0119	Introduction to data structures & algorithms	6
CH0102	Punongphao course for Engineering students	3
SOC0115	Japanese society	3
ECO0213	Microeconomic analysis	6
BUS0102	Introduction to accounting	6
PHY0017	Renewable energy	3
STA0102	Linear statistical analysis	6
AMR0902	Issues in American business: Wall Street	3
MR0210	Music of China	6
POL0020	Hong Kong politics	6
SOC0095	Culture and society	6

Id	Surname	Firstname	Year	Campus/build
t35admin	Chan	Tai Min	2	2

In the above example, the scheduling information of the university number "t1admin" is shown. In your answer, this university number should be equal to the username that is provided to your team.

Hints:

1. When you configure the portlet, please use your machine IP as part of the url link. For example: `http://your machine IP:9080/Q3-web/student_profile.faces`. You might type `ipconfig` in Command Prompt to get your machine IP.
2. You do not need to append your "id" at the end of the url above, the portlet will append your id when login to Portal.
3. The above screen is in the "Home" page.

2.7 Managing User and Group Entries in the Directory Server (100 Points)

In this question, you will manage user and group entries in Tivoli Directory Server through LDAP commands. You would use LDAP Data Interchange Format (LDIF) file as input for some LDAP commands.

Please take note of the following parameters:

1. LDAP Server hostname: portal.ibm.com
2. LDAP Server port number: 1389
3. Distinguished Name (DN) of the team administrator object for LDAP authentication: uid=t<#>admin,cn=team<#>,cn=users,dc=ibm,dc=com
where <#> is your team number.
For example, if you belong to team4, the DN you should use for LDAP authentication should be "uid=t4admin,cn=team4,cn=users,dc=ibm,dc=com"
4. Password of team administrator object: ~~password~~ *Please refer to item 2 of Appendix A.*
5. User container object of each team: cn=team<#>,cn=users,dc=ibm,dc=ibm
where <#> is your team number.
6. Group object of each team: cn=team<#>,cn=groups,dc=ibm,dc=ibm
where <#> is your team number.

Part 1: Add one user under the user container object of your team.

In this part, you use ldapadd command (under "C:\Program Files\IBM\LDAP\V6.1\bin" directory) to add a user entry of objectclass "inetorgPerson" with the following DN and attributes:

*LDIF
File*

```
dn: uid=t<#>user,cn=team<#>,cn=users,dc=ibm,dc=com
cn: user
sn: team<#>
uid: t<#>user
userpassword: password
```

ldap add

where <#> is your team number.

You must specify the object class information for the LDAP user object entry you need to add. Note that the object class hierarchy information of inetorgPerson is shown below.

```
objectclass: inetorgPerson
objectclass: top
objectclass: person
objectclass: organizationalPerson
```

The parameters to be used for the ldapadd command are as follows:

- h <LDAP server name>
- p <LDAP server port number>
- D <DN for LDAP authentication>

-w <password for LDAP authentication>
-f <input LDIF file path>

Part 2: Add the new user as a member of the group of your team.

The group object of your team already exists in the LDAP server. Its distinguished name is

`cn=team<#>,cn=groups,dc=ibm,dc=com`

where <#> is your team number.

In this part, you need to use `ldapmodify` command (under "`C:\Program Files\IBM\LDAP\V6.1\bin`" directory) to add the new user you have just added in the previous exercise to the group, by adding the DN of the user object as a value of the group object's `uniqueMember` attribute.

The parameters to be used for the `ldapmodify` command are as follows:

-h <LDAP server name>
-p <LDAP server port number>
-D <DN for LDAP authentication>
-w <password for LDAP authentication>
-f <input LDIF file path>

Hints:

1. This is an example of an LDIF file that adds a `telephonenumber` attribute to an existing user object with distinguished name of `uid=millie,o=ibm,c=hk`:

```
dn: uid=millie,o=ibm,c=hk
changetype: modify
add: telephonenumber
telephonenumber: +1 415 555 0002
```

2. To display the group object of your team, you may issue the following `ldapssearch` command (under "`C:\Program Files\IBM\LDAP\V6.1\bin`" directory):

```
ldapssearch -h <LDAP server name> -p <LDAP server port number> -D <DN for LDAP authentication> -w <password for LDAP authentication> -s one -b cn=team<#>,cn=groups,dc=ibm,dc=com (objectclass=*)
```

where <#> is your team number.

Part 3: Login to Portal Server, use your newly created user account 't<#>user'

Connect to the portal server through the provided URL stored in "Favorites->Q6 –IBM WebSphere Portal" in the Internet Explorer.

The screenshot shows the IBM WebSphere Portal interface in Internet Explorer. The browser address bar displays a URL starting with 'http://portal.ibm.com'. The portal header includes navigation links like 'WebSphere Portal', 'Applications', and 'Search Center'. The user is logged in as 'user'.

Student Schedule

University Number: t35user

Course	Sem	Sub	Unit	Status
BU50102	2	F	6	TS
CHI0102	2	A	3	TA
CSE0119	2	B	6	TW
CSE0120	1	A	6	TW
CSE0122	2	A	6	TW
ECO0213	1	A	6	TW
ENG0104	1	A	3	TA
ENG0106	1	A	6	TA
ENG0107	1	B	6	TW
PHY001*	2	A	3	TS
SOC0118	1	B	3	TS
STA0102	2	A	6	TW

Course Taken: 12 Total Credit Units: 60

Optional Courses

Code	Title	Unit
ENG0104	Engineering mathematics	3
ENG0106	Digital logic	6
ENG0107	Foundations of computer science	6
CSE0120	Computer programming I	6
CSE0122	Computer programming II	6
CSE0119	Introduction to data structures & algorithms	6
CHI0102	Putonghua course for Engineering students	3
SOC0118	Japanese society	3
ECO0213	Microeconomic analysis	6
BU50102	Introduction to accounting	6
PHY001*	Renewable energy	3
STA0102	Linear statistical analysis	6
AMR0002	Issues in American business: Wall Street	3
MUS0210	Music of China	6
POL0020	Hong Kong politics	6
SOC0008	Culture and society	6

Student Information

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 Surname: Wong
 Firstname: Siu Fu
 Year: 1
 Curriculum: 2