

Program 4: Final Project

Topic: Online Quiz Portal

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Documentation:

This project is an online quiz portal where user can give tests of different programming languages and admin can add questions to the quizzes. Additionally, user can view results and evaluate their performance. Admin can view performance of all the users.

The project is a distributed 3-tier application, where clients can send the HTTP Requests using web browser as 1st tier, the middle tier is an application server which is hosted on Glassfish server. The middle layer is designed using Java servlets EJB's. servlets are responsible for receiving the requests from the webserver and process those requests and produce response to send back to the webserver. Sessions beans in the application are responsible for performing all the business logic. Entity beans hold the data in the form of entities and used by the session beans. Finally, the 3rd tier is a MySQL database server which is hosted on the Microsoft azure.

Application gives below functionalities:

- Register/Login to the application:
The welcome page of the application is login page. If user is not already registered, then user can register by clicking on the register button. User needs to provide the full name, username and password. By default, user is added as user, however if user can register himself as admin by selecting the admin option as yes. If already registered, then user can give username and password and login to the application.

Here, Login servlet receives the request from login.jsp or register.jsp. Login servlet get the response from the UserBean. The UserBean handles all the business login to register new user and authenticate the user. User entity contains the details of the user that is being used by the userbeans. The UserBean creates the connection with the azure mysql db using jdbc driver and save/get user data from login table.

After successful authentication user session is created by the servlet and user then redirected to the respective homepage of application based on the profile of the user (i.e admin or user) .

- Homepage to view quizzes and navigate:
Homepage lists all the programming language quizzes. Users can select the programming language and then start the quiz. Whereas the admin can select the programming language to add new questions to the quiz.
- Admin: add new questions :
After selecting the programming language admin lands to the page where he/she can add new questions to the quiz. Admin has been given an option to add more questions or finish adding question. Admin has to give question along with 4 options and correct answer for that question in the form.

From adminHome.jsp whenever admin selects the option the type of quiz added as query parameter. The AdminMain servlet use that parameter add into the session for further user. The AdminAction servlet receives the form data from the request. AdminAction servlet creates the question object and add into the quiz. Quiz is a collection of questions.

This Quiz object is then given to the adminbean which is responsible to perform database transactions and add the details to the question table.

- user: take quizzes:

After selecting the programming language user lands to the page where quiz instructions are given. By default, quiz contains the 10 questions. Then user can start the quiz and 1 question appears on the screen at a time with 4 options. User needs to select the answer and go to the next question. User has given option to go back and forth between the questions. When user selects the 'save and finish exam' button quiz is submitted for evaluation.

The selected quiz type is added in query string and also saved in the session. Exam servlet receives the exam form data from exam.jsp. ExamServlet then get the type of exam from session and created the quiz object. This object is saved in session so that same object can be used until exam is not finished. Question along with user selected option is saved in question object and that question object is added to the quiz object. When user finished the exam then quiz object is given to quiz bean to evaluate the quiz result.

- Evaluate the result of the quizzes:

When user finished the exam instantly result is evaluated and showed to the user. If user receives less than 5 marks, then failed remark is given otherwise passed remark is given.

QuizBean performs the business logic to evaluate the result of the quiz. Here, result is decided by calculating the total correct answers by doing comparison of correct answers and user selected answers. This result is then saved to the userResult table in the database.

- View results of the quizzes:

User can view the result of all the quizzes by selecting my Result option from homepage. If quiz is passed, then it is shown in green color otherwise in red color.

QuizBean communicates with the azure mysql database to fetch the previous results of the user from userResult table. ResultServlet uses this data received from QuizBean and response is given to the userPanel.jsp.

- Admin: view performance of all users:

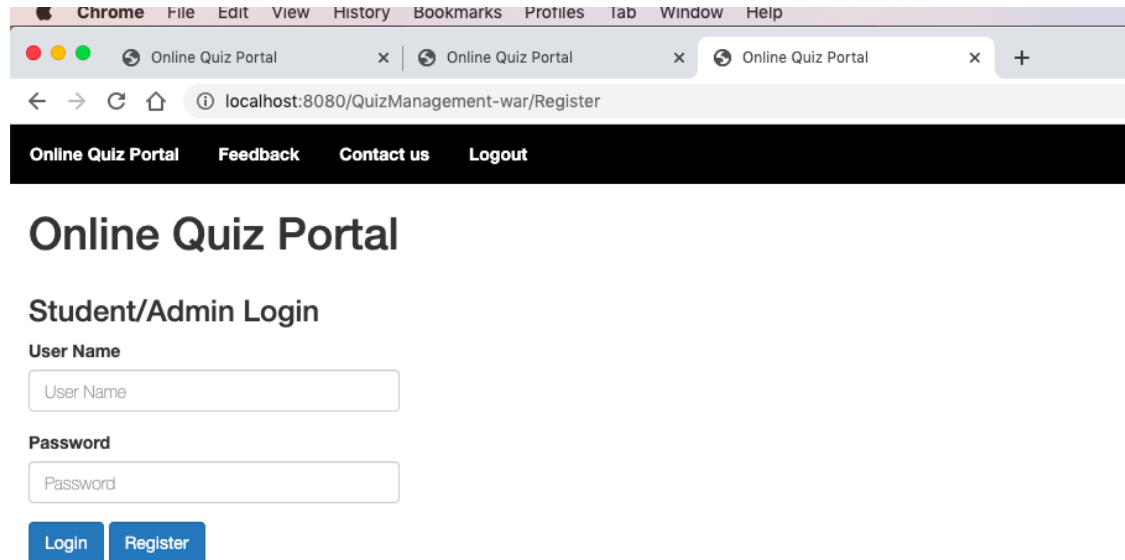
Admin can view the results of all the users.

AdminBean gets the data from userResult for all users. This data is saved in hashmap with key as test id and value as inner hashmap. Inner hashmap has key as userid and value as result. AdminActions servlets get this hasmap and save into the request. adminPanel get the hasmap from request and show all the details in UI.

Execution Output:

1. Snapshot of GUI

Login page:



The screenshot shows a web browser window with the title 'Online Quiz Portal'. The address bar displays 'localhost:8080/QuizManagement-war/Register'. The page has a dark navigation bar with links: 'Online Quiz Portal', 'Feedback', 'Contact us', and 'Logout'. Below the navigation bar, the main heading is 'Online Quiz Portal'. Underneath, it says 'Student/Admin Login'. There are two input fields: 'User Name' and 'Password'. Below these fields are two buttons: 'Login' and 'Register'.

Chrome File Edit View History Bookmarks Profiles Tab Window Help

Online Quiz Portal x Online Quiz Portal x Online Quiz Portal x +

localhost:8080/QuizManagement-war/Register

Online Quiz Portal Feedback Contact us Logout

Online Quiz Portal

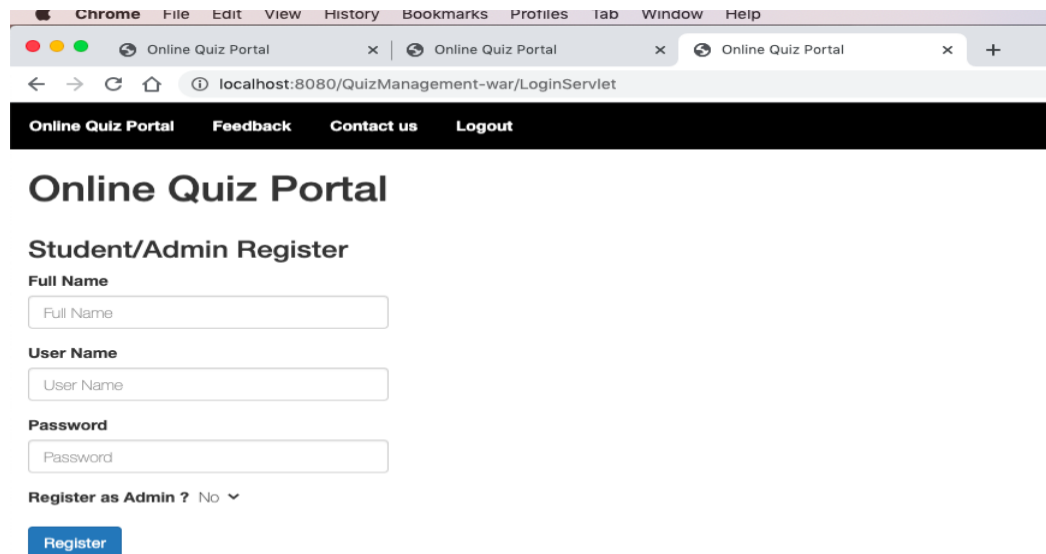
Student/Admin Login

User Name

Password

Login Register

Register:



The screenshot shows a web browser window with the title 'Online Quiz Portal'. The address bar displays 'localhost:8080/QuizManagement-war/LoginServlet'. The page has a dark navigation bar with links: 'Online Quiz Portal', 'Feedback', 'Contact us', and 'Logout'. Below the navigation bar, the main heading is 'Online Quiz Portal'. Underneath, it says 'Student/Admin Register'. There are three input fields: 'Full Name', 'User Name', and 'Password'. Below these fields is a dropdown menu labeled 'Register as Admin ?' with 'No' selected. At the bottom is a 'Register' button.

Chrome File Edit View History Bookmarks Profiles Tab Window Help

Online Quiz Portal x Online Quiz Portal x Online Quiz Portal x +

localhost:8080/QuizManagement-war/LoginServlet

Online Quiz Portal Feedback Contact us Logout

Online Quiz Portal

Student/Admin Register

Full Name

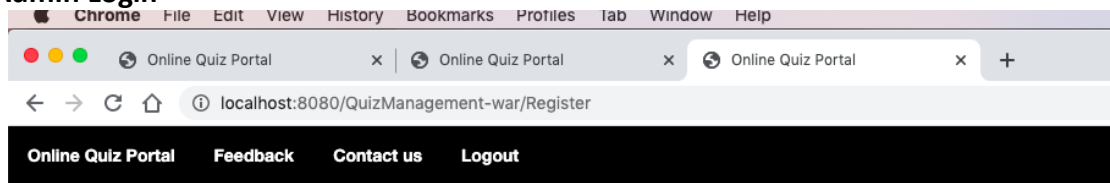
User Name

Password

Register as Admin ? No ▾

Register

Admin Login



Online Quiz Portal

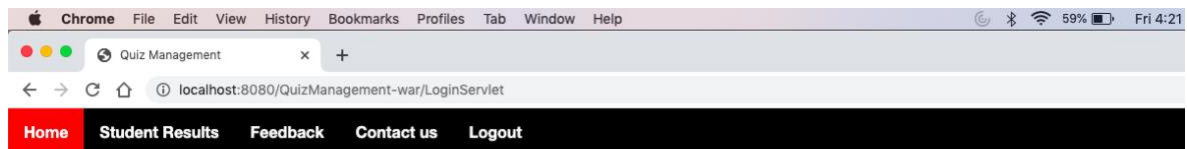
Student/Admin Login

User Name

Password

Login Register

Admin Homepage



Admin – add new questions to the quiz

On the click of 'add and Finish'

Quiz - Code Quiz - Test Your P x +

localhost:8080/QuizManagement-war/addExam?test=sequel

Home Student Results Feedback Contact us Logout

Add question to the Quiz

Question

Which of the following is not a developer's privilege?

Option 1

CREATE USER

Option 2

CREATE TABLE

Option 3

CREATE TABLE

Option 4

CREATE TABLE

Correct Answer

1

Add More Questions Add and Finish

Database output:

azureDbConnection

Administration Schemas Query 1 question subject question question - Table subject question subject question subject

Limit to 1000 rows

1 • SELECT * FROM quiz.question where Sub_id=4;

100% 43:1

Result Grid Filter Rows: Search Edit: Export/Import:

id	Sub_id	Title	Option1	Option2	Option3	Option4	Correct
15	4	Which of the following is not true about the COAL...	It takes multiple alternate...	It returns the first non-null exp...	It returns the first valu...	None of the above.	2
16	4	Which of the following is not true about the MAX a...	Both can be used for any...	MAX returns the maximum va...	MIN returns the minim...	All are true.	3
17	4	Which of the following is not true about simple vie...	They derive data from on...	They contain no functions or...	You cannot perform D...	You cannot perform D...	2
18	4	Which of the following is not a developers privilege?	CREATE USER	CREATE TABLE	CREATE VIEW	CREATE SEQUENCE	0
19	4	Which of the following is true about the RDBMS?	RDBMS stands for the Re...	RDBMS is mandatory to use...	Both a and b.	None of these.	2
			NULL	NULL	NULL	NULL	NULL

Add More Questions:

Quiz - Code Quiz - Test Your P x +

localhost:8080/QuizManagement-war/AdminAction

[Home](#) [Student Results](#) [Feedback](#) [Contact us](#) [Logout](#)

Add question to the Quiz

Question
Which of the following is not true about views?

Option 1
Can be created only from one table.

Option 2
Grouping using functions is present.

Option 3
No DML queries can be executed on the views.

Option 4
All of the above statements are true.

Correct Answer
d

[Add More Questions](#) [Add and Finish](#)

Quiz - Code Quiz - Test Your P x +

localhost:8080/QuizManagement-war/AdminAction

[Home](#) [Student Results](#) [Feedback](#) [Contact us](#) [Logout](#)

Add question to the Quiz

Question
Which of the following is used to modify the data stored in the database?

Option 1
SELECT

Option 2
INSERT INTO

Option 3
UPDATE

Option 4
LIMIT

Correct Answer
1

[Add More Questions](#) [Add and Finish](#)

Database screenshots after additions:

The screenshot shows the SQL Server Enterprise Manager interface. The left pane displays the 'SCHEMAS' tree with the 'quiz' schema selected. The right pane shows a query window with the following SQL statement:

```
1 • SELECT * FROM quiz.question where Sub_id=4;
```

The query results are displayed in a grid with the following columns: id, Sub_id, Title, Option1, Option2, Option3, and Option4. The results show 26 rows of data, including various SQL-related questions and their options.

id	Sub_id	Title	Option1	Option2	Option3	Option4
15	4	Which of the following is not true about the COALESCE funct...	It takes multiple alternate...	It returns the first non-null exp...	It returns the first valu...	None of the above.
16	4	Which of the following is not true about the MAX and MIN funct...	Both can be used for any...	MAX returns the maximum va...	MIN returns the minim...	All are true.
17	4	Which of the following is not true about simple views?	They derive data from on...	They contain no functions or...	You cannot perform D...	You cannot perform D...
18	4	Which of the following is not a developers privilege?	CREATE USER	CREATE TABLE	CREATE VIEW	CREATE SEQUENCE
19	4	Which of the following is true about the RDBMS?	RDBMS stands for the Re...	RDBMS is mandatory to use...	Both a and b.	None of these.
20	4	Which of the following join extracts data of matching rows from...	Full Outer Join	Left Join	Right Join	None of these.
21	4	Which of the following is true about a cursor in SQL?	It is read-only.	The cursor can perform all th...	Cursors are objects of...	Cursors are created...
22	4	SQL database follows which of the following principles?	ACID	AGILE	SQL	DBMS
23	4	Which of the following is not a data type in SQL?	int	Varchar	Image	blob
24	4	Which of the following is not a Clause in SQL?	Below	Limit	Where	Group By
25	4	Which of the following is used to modify the data stored in the...	SELECT	INSERT INTO	UPDATE	LIMIT
26	4	Which of the following is not true about views?	Can be created only from...	Grouping using functions is p...	No DML queries can...	All of the above state...

user Results:

Admin can view the results of all the users

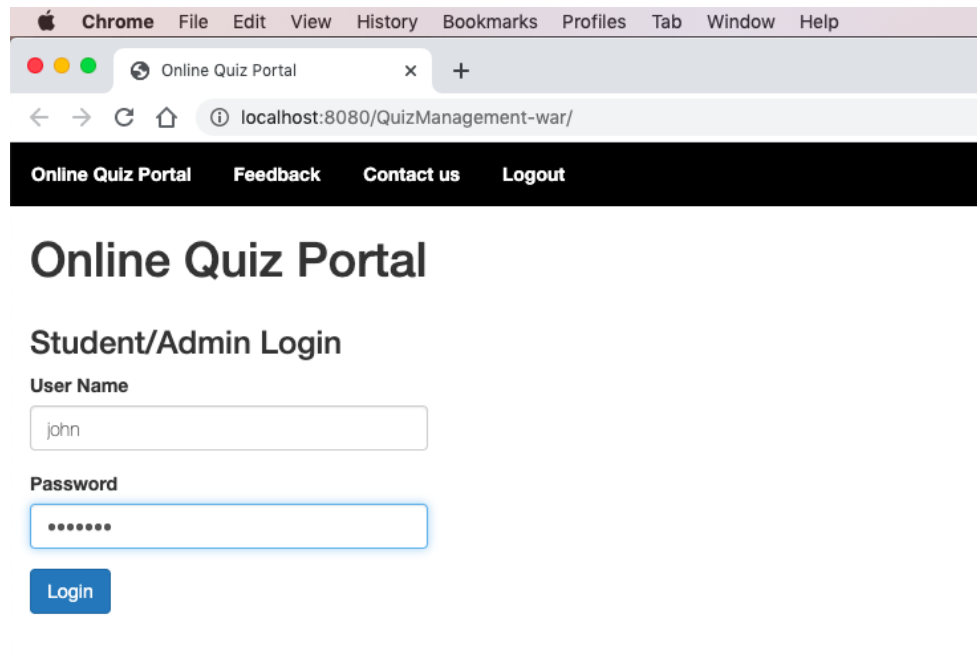
The screenshot shows a web application interface. The top navigation bar includes links for Home, My Results, Feedback, Contact us, and Logout. The main content area displays the 'Test Results of all the Students' page, which lists the test results for four users: Rachel, John, Sayali, and Sequel.

Logged as, admin

Test Results of all the Students

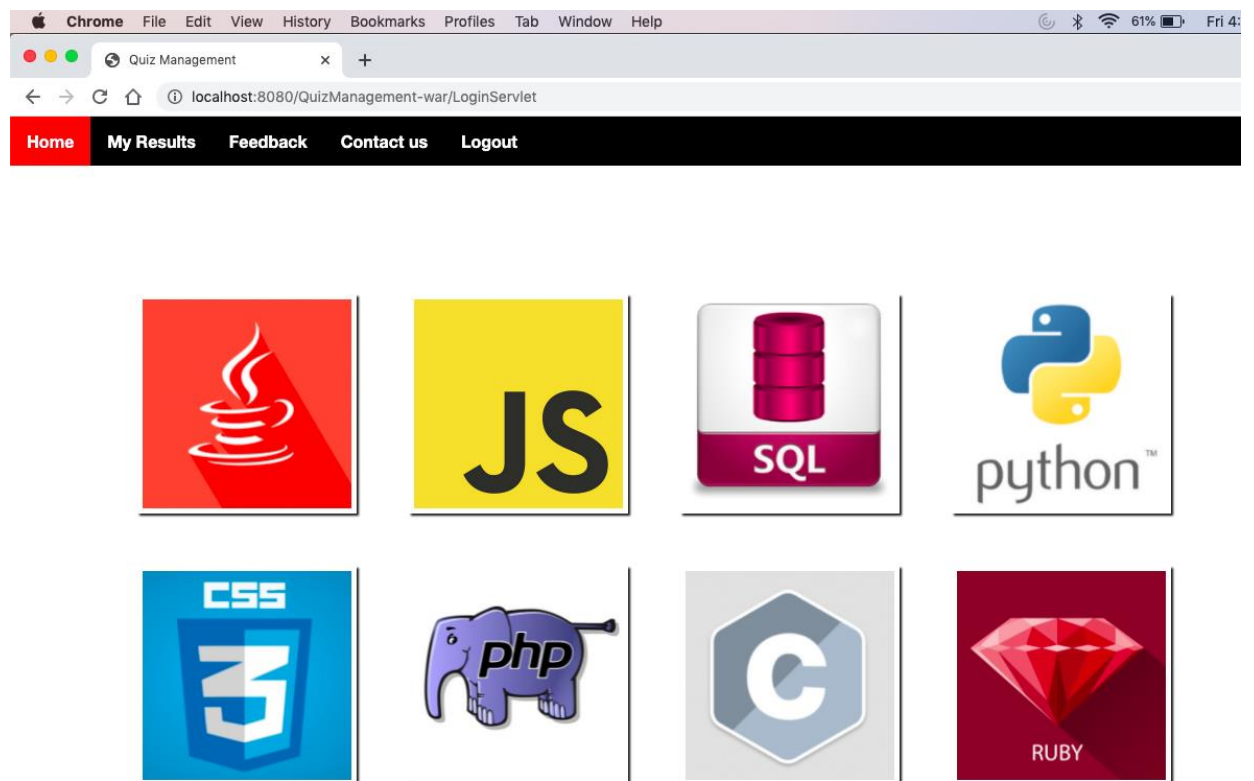
java : Rachel : 10
 java : john : 7
 java : sayali : 6
 sequel : john : 6
 sequel : sayali : 7

user Login:

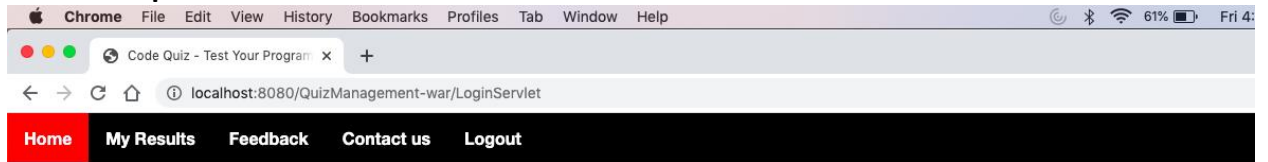


The screenshot shows a web browser window with the title "Online Quiz Portal". The address bar displays "localhost:8080/QuizManagement-war/". A navigation bar at the top contains links: "Online Quiz Portal", "Feedback", "Contact us", and "Logout". The main heading is "Online Quiz Portal". Below it is the section "Student/Admin Login". There are two input fields: "User Name" with the text "john" and "Password" with masked characters ".....". A blue "Login" button is positioned below the password field.

HomePage of the user Page:



Take Java quiz :



Quiz Instructions:

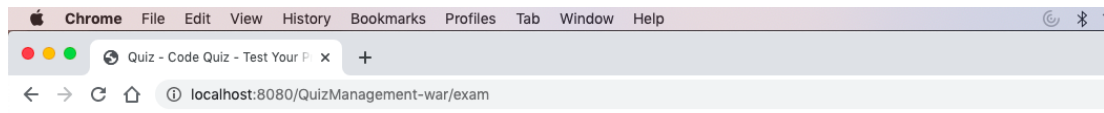


Instruction for java Quiz :

- Quiz contains 10 Multiple Choice Questions,
- Passing grade is 5 out of 10,
- You can end your test at any time,
- Read the questions carefully before answering,
- You can change your answers before submitting,
- Good luck for the test!

[Start Exam](#)

Java Quiz:



Current Question 1 / 10

Which is aggregate operation in Java 8

- ☐ filter
- ☐ map
- ☐ forEach
- ☐ All

Next

Cancel and Return

Save and Finish Exam



Current Question 2 / 10

What can help us in avoiding NullPointerExceptions and null checks in java 8

- ☐ Optional
- ☐ Required
- ☐ NotNull
- ☐ NotRequired

Previous

Next

Cancel and Return

Save and Finish Exam



Current Question 10 / 10

Which entry in WEB-INF is used to map a servlet ?

- ☒ servlet-mapping
- ☐ servlet-registration
- ☐ servlet-entry
- ☐ servlet-attachment

Previous

Cancel and Return

Save and Finish Exam

Quiz Result after finishing the quiz

Chrome File Edit View History Bookmarks Profiles Tab Window Help

Test Result - Code Quiz - Test x +

localhost:8080/QuizManagement-war/exam

Home My Results Feedback Contact us

Logged as, john

Quiz Result
Quiz : java
Starting Time : 2021/06/04 16:18:59 PM
Number of Questions : 10
Number of correct answers : 7

Congratulations! You Passed the Test

[Take Another Exam](#)

SQL Quiz:

Dashboard x Dashboard x Quiz - Code Quiz - Test Your P x +

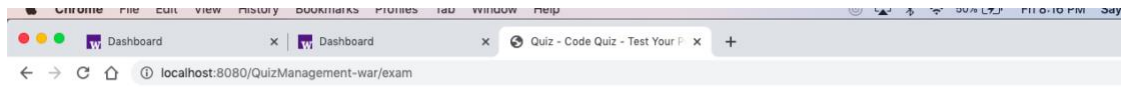
localhost:8080/QuizManagement-war/takeExam?test=sequel

Home My Results Feedback Contact us Logout

Instruction for sequel Quiz :

- Quiz contains 10 Multiple Choice Questions,
- Passing grade is 5 out of 10,
- You can end your test at any time,
- Read the questions carefully before answering,
- You can change your answers before submitting,
- Good luck for the test!

[Start Exam](#)



Current Question 5 / 10

SQL database follows which of the following principles?

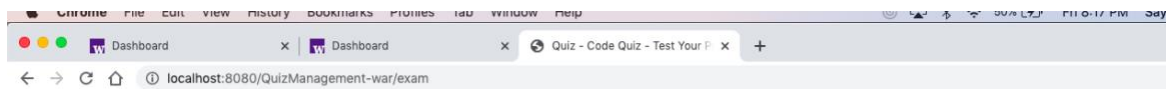
- ☒ ACID
- ☐ AGILE
- ☐ SQL
- ☐ DBMS

Cancel and Return

Previous

Next

Save and Finish Exam



Current Question 10 / 10

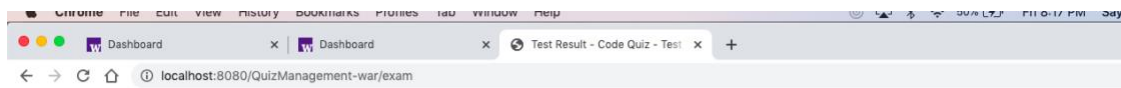
Which of the following is not true about simple views?

- ☐ They derive data from one table.
- ☐ They contain no functions or grouping.
- ☐ You cannot perform DML operations through a simple view.
- ☐ You cannot perform DML operations through a simple view.

Cancel and Return

Previous

Save and Finish Exam



Home My Results Feedback Contact us

Logged as, Rachel

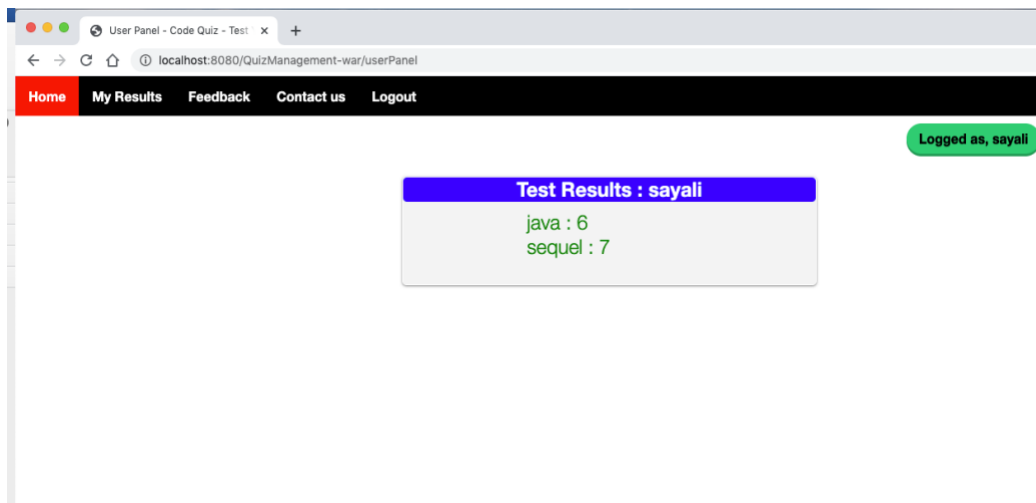
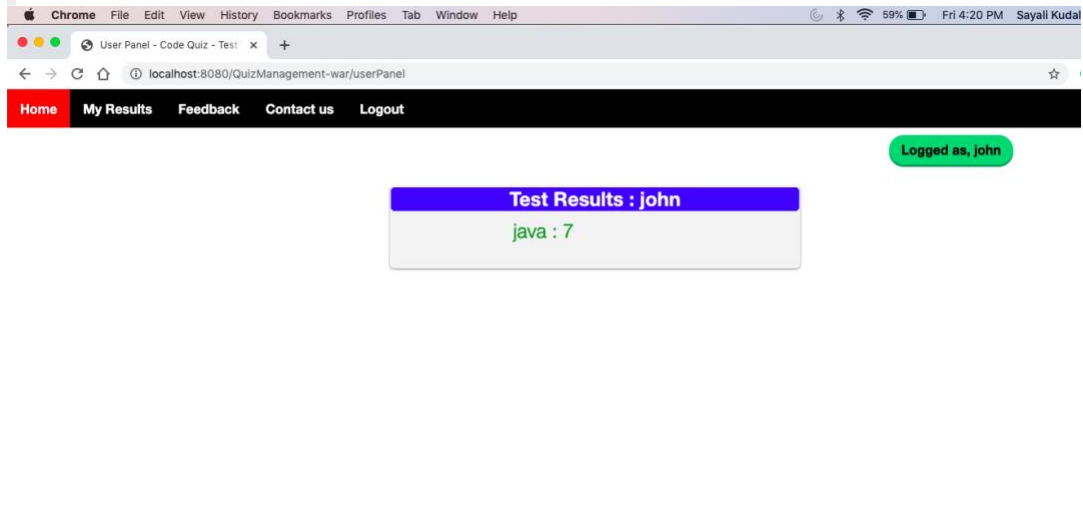
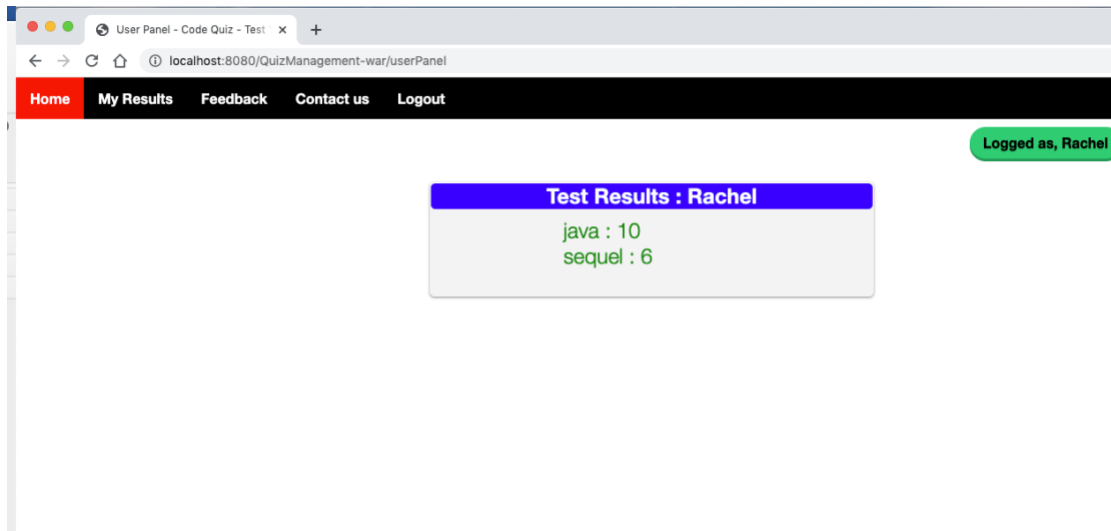
Quiz Result

Quiz : sequel
Starting Time : 2021/06/04 20:16:01 PM
Number of Questions : 10
Number of correct answers : 6

Congratulations! You Passed the Test

[Take Another Exam](#)

My Result Page user:



My Result Page Admin:

User Panel - Code Quiz - Test x

localhost:8080/QuizManagement-war/StudentResults

Home

My Results

Feedback

Contact us

Logout

Logged as, admin

Test Results of all the Students

java : Rachel : 10
java : john : 7
java : sayali : 6
sequel : john : 6
sequel : sayali : 7

2. Snapshot of third tier: Microsoft Azure Instance

Dashboard x azure-mysql-sayali - Microsoft x

portal.azure.com/#@cloud.washington.edu/resource/subscriptions/98c88ec0-6743-49bc-8f38-fa416d125318/resourceGroups/mysqlResourceGroup/providers/Micro...

Microsoft Azure Upgrade Search resources, services, and docs (G+)

sayalik@uw.edu UW

Home >

azure-mysql-sayali Azure Database for MySQL server

Stop Reset password Restore Delete Restart Feedback

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Settings

Connection security

Connection strings

Server parameters

Replication

Active Directory admin

Pricing tier

Properties

Locks

Security

Azure Defender for MySQL

Private endpoint connections

Essentials

Resource group (change) : mysqlResourceGroup

Status : Available

Location : East US

Subscription (change) : Azure subscription 1

Subscription ID : 98c88ec0-6743-49bc-8f38-fa416d125318

Tags (change) : Click here to add tags

Server name : azure-mysql-sayali.mysql.database.azure.com

Server admin login name : sayaliUser@azure-mysql-sayali

MySQL version : 5.7

Performance configuration : General Purpose, 4 vCore(s), 100 GB

SSL enforce status : DISABLED

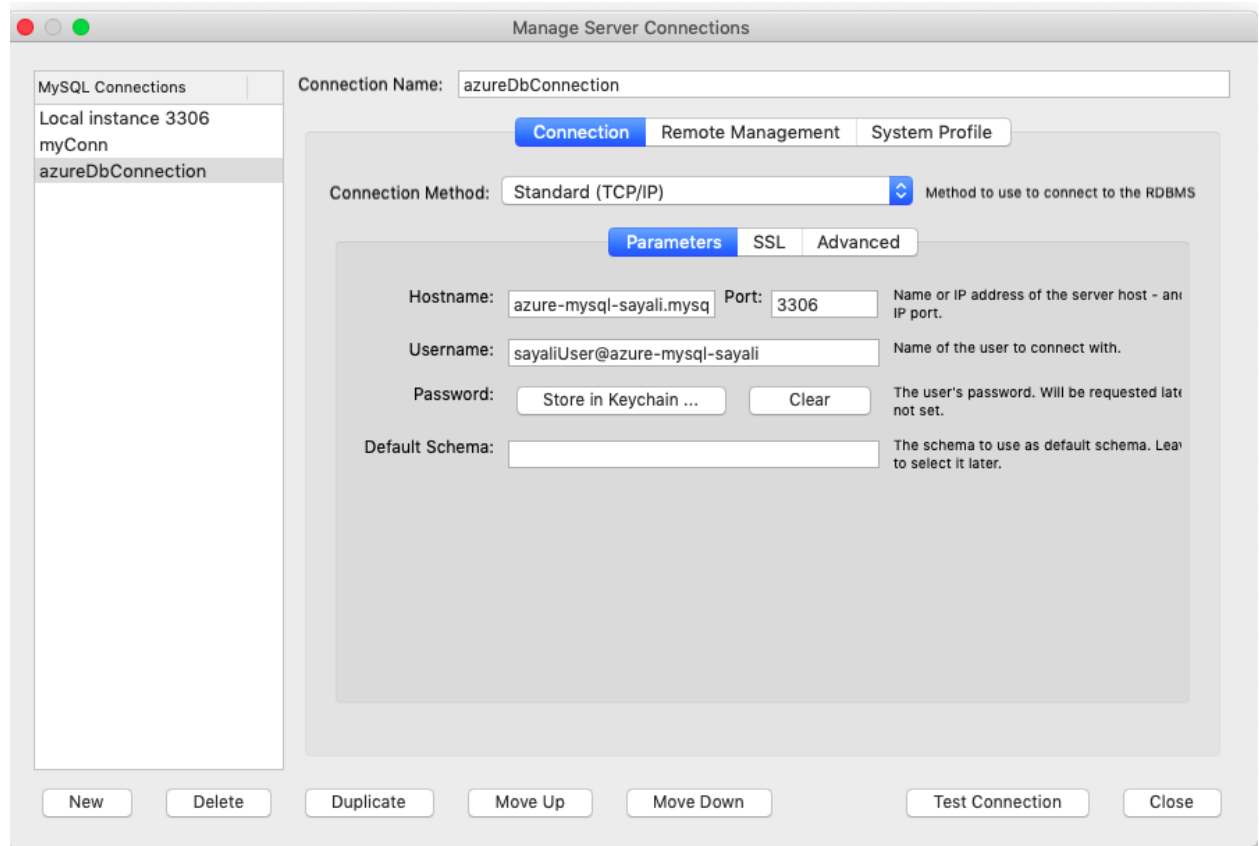
JSON View

Resource utilization (azure-mysql-sayali)

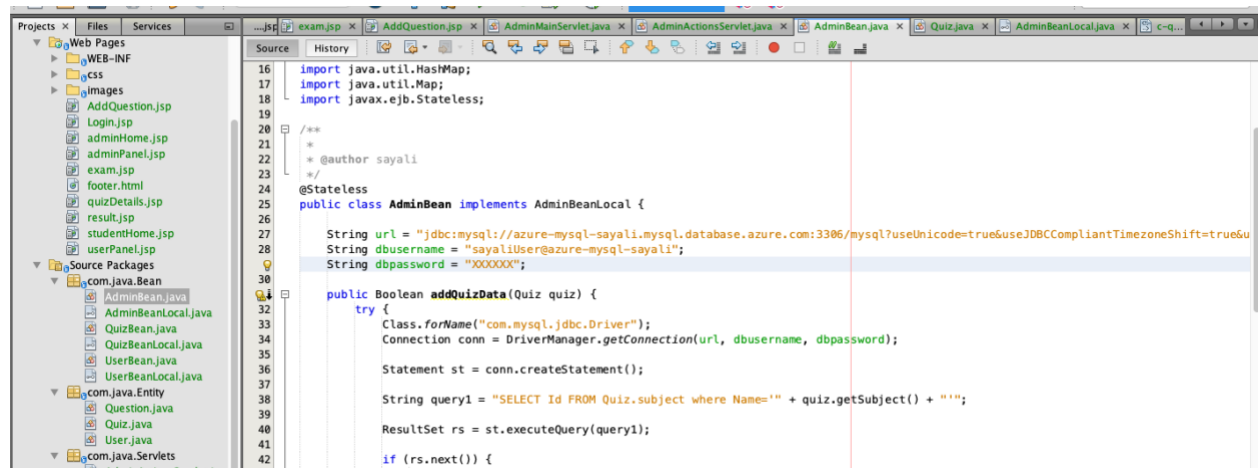
Show data for last: 1 hour 24 hours 7 days Aggregation type: Avg

Time (UTC)	CPU percent (Avg)	Storage percent (Avg)
4:15 PM	0.0%	0.0%
4:30 PM	0.8%	0.0%
4:45 PM	0.0%	0.0%
5 PM	0.0%	0.0%
UTC-07:00	0.0%	0.0%

MySQL Workbench Connection with azure



Connection String in the code:



Discussions:

This project was great hands-on EJB servlet and JSP. As development of the 3 tier is done from the scratch it gives clear understanding how each layer communicates with one another.

Performance:

The Online quiz portal application deals with many EJB components. Decomposition of many EJB can create the overhead and in turn degrade the performance of application. However, below measures are taken to improve the application performance:

1. The application is developed using Stateless Session Beans and Message Driven Beans which gives highest performance, because each stateless session bean instance can support multiple clients, although one at a time.
2. Servlet caches EJB reference. Due to this for every request application doesn't do JNDI lookup to get EJB reference.
3. The important attributes such as username, quiz type, user type is stored in the session, this avoids the calls to the application and database server, and this boosts the performance of the application.
4. When user starts the quiz, all the quiz questions are not loaded at once, instead it is maintained in the servlets and once user answers the first question next appears. This has reduced page loading time.
5. Unnecessary database calls are avoided and whenever possible all the required data is gathered in single call. This has improved the performance by removing the unnecessary roundtrips to the database server.
6. Azure MySQL database provides the monitoring system where key performance indicators and query statistics are visible and if any query takes the more time, then that query can be optimized.

The application provides below functionality in terms of reliability:

1. Microsoft azure MySQL database provides the high availability feature which improves the reliability of the application.
2. This application is developed using EJB's and can be deployed on cluster and benefit from the features such as load balancing, failover from remote client EJBs to improve the performance of the application.
3. The application is distributed 3 tier applications where database tier is deployed in azure cloud, hence even if one application server fails the data which is stored in 3rd party server will not impact.
4. User is not allowed to enter to website without proper authentication. Also, if user is normal user then user doesn't view the details such as score of other user.

The application provides below functionality in terms of usability:

1. The application is easy to use and understand.
2. The design of the website is self-evident and obvious.
3. Navigation menu is given so that users can navigate to different pages easily.
4. The GUI is simple, pleasant, and minimalistic.
5. The instructions given before the quiz is helpful to users while giving quiz.

Due to all these aspects usability of the application is improved, and users can perform the tasks easily.

Improvements in the project:

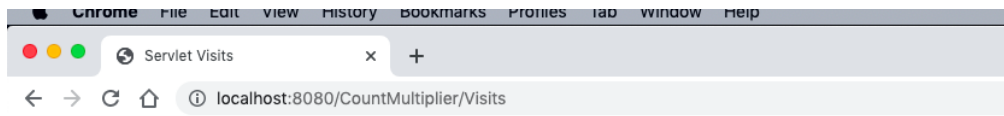
1. The quiz can have time limit.
2. Quiz questions can be fetched from the web or 3rd party source randomly along with the existing functionality where admin can add questions to the quiz.
3. Currently, in result only marks are shown. Functionality can be improved to view the past quiz details with user selected answers and correct answers.
4. Users can share the quiz score with one another and can invite other users to beat the score.
5. Hints can be given to the user while attempting the quiz.
6. Code can be improved by having the single file with database connection tasks.

Limitations:

1. The Quiz can have at the most 10 questions.
2. The admin cannot delete the already added questions. Every time last 10 questions which are recently added are selected as a quiz.
3. Fixed set of quizzes. Admin would be given an option to create new subject and add questions to it.

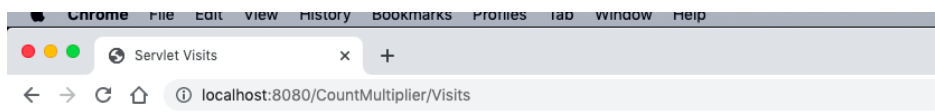
Lab Sessions:

Lab 8 output:



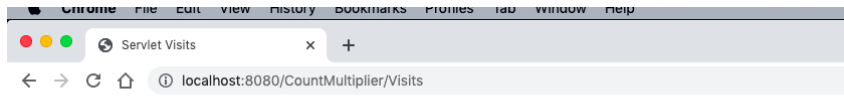
Servlet Visits at /CountMultiplier

You are the 1st Visitor



Servlet Visits at /CountMultiplier

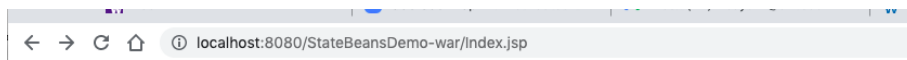
You are the 2nd Visitor



Servlet Visits at /CountMultiplier

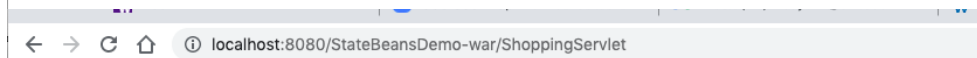
You are the 7th Visitor

Lab 9 output:



Shopping

Enter Product: Complete Shopping:



Servlet ShoppingServlet

Office Chair in your shopping bag

← → ↻ 🏠 ⓘ localhost:8080/StateBeansDemo-war/ShoppingServlet

Servlet ShoppingServlet

Mouse in your shopping bag

Your items:

Office Chair
Apple Laptop
Desk Table
KeyBoard
Mouse

shopping completed.....Thank you!