

6. Quiz Application 2

1. Rest Controller Layer

The **QuestionController** handles all incoming HTTP requests related to questions. This controller calls the service layer to fetch, save, or retrieve questions.

```
@RestController
@RequestMapping("question")
public class QuestionController {

    @Autowired
    QuestionService questionService;

    @GetMapping("allQuestions")
    public List<Question> getAllQuestions() {
        return questionService.getAllQuestions();
    }
}
```

- **Key Methods:**

- **getAllQuestions()**: Fetches all the questions in the database.
 - **URL: /question/allQuestions** (HTTP GET)
- **getQuestionsByCategory(String category)**: Fetches questions filtered by category (like Java, Python, etc.).
 - **URL: /question/category/{category}** (HTTP GET)
- **addQuestion(Question question)**: Adds a new question to the database.
 - **URL: /question/add** (HTTP POST)

2. Repository Layer

The repository interacts with the database using Spring Data JPA. This layer abstracts the database queries.

```
@Repository
public interface QuestionRepository extends JpaRepository<Question, Integer> {
    public List<Question> findByCategory(String category);
}
```

- **findByCategory(String category)**: Custom query method to fetch questions by their category.

3. Service Layer

The service layer contains the business logic for fetching or storing data. It acts as a bridge between the controller and repository layers.

```
@Service
public class QuestionService {

    @Autowired
    QuestionRepository questionRepository;

    public List<Question> getAllQuestions() {
        return questionRepository.findAll();
    }
}
```

- **Key Methods:**
 - **getAllQuestions()**: Calls the repository to fetch all questions.
 - **getQuestionsByCategory(String category)**: Calls the repository to fetch questions by category.
 - **addQuestion(Question question)**: Adds a question to the database.

4. Entity

The **Question** class represents the database table structure. It maps the object fields to columns in the database.

```

@Entity
@Data
@NoArgsConstructor
public class Question {

    @Id
    @GeneratedValue(strategy = GenerationType.SEQUENCE, generator = "question_seq")
    @SequenceGenerator(name = "question_seq", sequenceName = "question_sequence", allocationSize = 1,
                                                                initialValue = 11)
    private Integer id;
    private String questionTitle;
    private String option1;
    private String option2;
    private String option3;
    private String option4;
    private String category;
    private String rightAnswer;
    private String difficultyLevel;
}

```

- **Fields:**

- **id**: The primary key for each question.
- **questionTitle**: The question text.
- **option1**, **option2**, **option3**, **option4**: Multiple-choice options for the question.
- **rightAnswer**: The correct answer.
- **category**: The category of the question (e.g., Java, Python).
- **difficultyLevel**: Difficulty of the question (Easy, Medium, Hard).

6. SQL Insert Queries for Populating the Database

The following SQL scripts are used to insert questions into the **question** table for different categories like **Java**, **Python**, **C++**, **JavaScript**, and **PHP**.

Java Category:

```
INSERT INTO question (id, category, difficulty_level, option1, option2, option3, option4,
question_title, right_answer) VALUES
(1, 'Java', 'Easy', 'C++', 'Java', 'Python', 'Ruby', 'What programming language is primarily used
for Android development?', 'Java'),
(2, 'Java', 'Easy', 'JVM', 'JRE', 'JDK', 'JAVAC', 'Which one is the Java Virtual Machine?',
'JVM'),
(3, 'Java', 'Medium', 'Static', 'Dynamic', 'Both', 'None', 'In Java, method overloading is an
example of _____ polymorphism.', 'Static'),
(4, 'Java', 'Medium', 'Encapsulation', 'Inheritance', 'Polymorphism', 'Abstraction', 'What is the
main feature of Object-Oriented Programming?', 'Encapsulation'),
(5, 'Java', 'Easy', 'new', 'this', 'super', 'self', 'Which keyword is used to create an object in Java?',
'new');
```

Python Category:

```
INSERT INTO question (id, category, difficulty_level, option1, option2, option3, option4,
question_title, right_answer) VALUES
(6, 'Python', 'Easy', 'Python', 'Java', 'C++', 'C#', 'Which language is known as the "batteries
included" language?', 'Python'),
(7, 'Python', 'Medium', 'List', 'Tuple', 'Set', 'Dictionary', 'Which of the following is an
immutable data type in Python?', 'Tuple'),
(8, 'Python', 'Easy', '2', '3', '4', '5', 'How many built-in data types does Python have?', '9'),
(9, 'Python', 'Medium', 'def', 'func', 'function', 'method', 'What keyword is used to define a
function in Python?', 'def');
```

C++ Category:

```
INSERT INTO question (id, category, difficulty_level, option1, option2, option3, option4,
question_title, right_answer) VALUES
(10, 'C++', 'Easy', 'No', 'Yes', 'Maybe', 'Depends', 'Does C++ support multiple inheritance?',
'Yes'),
(11, 'C++', 'Medium', 'A', 'B', 'C', 'D', 'What is the default access modifier for class members in
C++?', 'Private'),
(12, 'C++', 'Easy', '2', '4', '8', '16', 'How many bytes is a pointer in C++ on a 32-bit system?', '4'),
(13, 'C++', 'Medium', 'new', 'malloc', 'calloc', 'All of the above', 'Which operator is used to
allocate memory in C++?', 'new');
```

JavaScript Category:

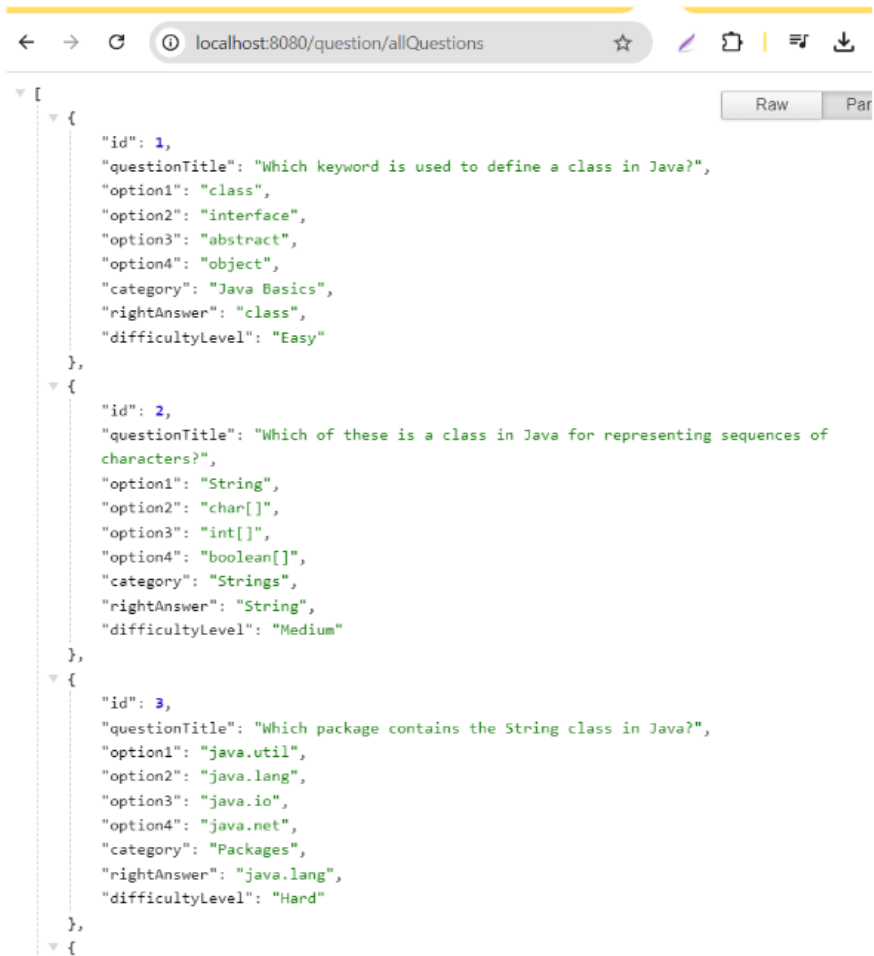
```
INSERT INTO question (id, category, difficulty_level, option1, option2, option3, option4,
question_title, right_answer) VALUES
(14, 'JavaScript', 'Easy', 'Java', 'JavaScript', 'C++', 'C#', 'Which language is primarily used for
web development?', 'JavaScript'),
(15, 'JavaScript', 'Medium', 'var', 'let', 'const', 'All of the above', 'Which of the following is not a
keyword in JavaScript?', 'None');
```

```
mysql> use questiondb;
Database changed
mysql> select * from question;
```

id	category	difficulty_level	option1 right_answer	option2	option3	option4	question_title
1	Java	Easy	C++	Java	Python	Ruby	What programming language is primarily used for Andro
2	Java	Easy	JVM	JRE	JDK	JAVAC	Which one is the Java Virtual Machine?
3	Java	Medium	Static	Dynamic	Both	None	In Java, method overloading is an example of _____
4	Java	Medium	Encapsulation	Inheritance	Polymorphism	Abstraction	What is the main feature of Object-Oriented Programmi
5	Java	Easy	new	this	super	self	Which keyword is used to create an object in Java?
6	Java	Easy	A	B	C	D	What will be the output of "System.out.println(10 + 2
7	Java	Hard	try	catch	throw	all of the above	Which keywords are used for exception handling in Jav
8	Java	Medium	Arrays	Collections	Lists	All of the above	What does ArrayList in Java use for storing elements?
9	Java	Hard	static	void	main	all of the above	Which keyword is used to define a main method in Java
10	Java	Easy	4	5	6	7	How many bytes does an int take in Java?
11	Python	Easy	Python	Java	C++	C#	Which language is known as the "batteries included" l
12	Python	Medium	List	Tuple	Set	Dictionary	Which of the following is an immutable data type in P
13	Python	Easy	2	3	4	5	How many built-in data types does Python have?
14	Python	Medium	def	func	function	method	What keyword is used to define a function in Python?

Test URL:

For allQuestions:



The screenshot shows a web browser window with the address bar displaying `localhost:8080/question/allQuestions`. Below the browser window, a REST client interface displays a JSON array of three question objects. The first object has an id of 1, a title about the 'class' keyword, and options 'class', 'interface', 'abstract', and 'object'. The second object has an id of 2, a title about classes for representing sequences of characters, and options 'String', 'char[]', 'int[]', and 'boolean[]'. The third object has an id of 3, a title about the package containing the String class, and options 'java.util', 'java.lang', 'java.io', and 'java.net'. Each object also includes a 'category', 'rightAnswer', and 'difficultyLevel' field.

```
[
  {
    "id": 1,
    "questionTitle": "Which keyword is used to define a class in Java?",
    "option1": "class",
    "option2": "interface",
    "option3": "abstract",
    "option4": "object",
    "category": "Java Basics",
    "rightAnswer": "class",
    "difficultyLevel": "Easy"
  },
  {
    "id": 2,
    "questionTitle": "Which of these is a class in Java for representing sequences of characters?",
    "option1": "String",
    "option2": "char[]",
    "option3": "int[]",
    "option4": "boolean[]",
    "category": "Strings",
    "rightAnswer": "String",
    "difficultyLevel": "Medium"
  },
  {
    "id": 3,
    "questionTitle": "Which package contains the String class in Java?",
    "option1": "java.util",
    "option2": "java.lang",
    "option3": "java.io",
    "option4": "java.net",
    "category": "Packages",
    "rightAnswer": "java.lang",
    "difficultyLevel": "Hard"
  }
]
```