

Birla Institute of Technology & Science, Pilani
Work Integrated Learning Programmes Division
First Semester 2024-2025

Comprehensive Examination
(EC-3 Regular)

Course No. : SE ZG503
Course Title : Full stack application development
Nature of Exam : Open Book
Weightage : 40%
Duration : 2 ½ Hours
Date of Exam : 01/12/2024 (FN)

No. of Pages	= 2
No. of Questions	= 7

Note to Students:

1. Please follow all the *Instructions to Candidates* given on the cover page of the answer book.
2. All parts of a question should be answered consecutively. Each answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

Question 1: [6]
Assume you are designing a web application for a popular news platform. The requirements of the platform are

- New articles are released every few minutes, and readers rightfully expect to see the latest news without delay.
- Many users find articles through search engines, so the site must rank well and load content quickly.
- The server capacity of the platform is limited, so any approach must reduce server load as much as possible while ensuring high performance for users.

Based on these requirements, recommend a suitable rendering approach for displaying content on the news platform. Justify your recommendation by detailing how the selected approach effectively meets each requirement. Additionally, explain how this approach enhances overall performance, improves search engine optimization (SEO), and maximizes server efficiency for the platform.

Question 2: [6]
A developer is experiencing performance issues with a web application, including slow loading times and inconsistent behavior across different browsers. Assess the importance of the build process in addressing these issues. Describe key build strategies that could improve the application's performance, speed of delivery, and compatibility. Explain the build process and how it will optimize front-end code.

Question 3: [6]
A mobile health app wants to enable users to log in using their existing accounts from popular health platforms, such as Apple Health/Google Fit. Evaluate the different OAuth 2.0 flows suitable for this integration based on increased security and implementation complexity. Based on your evaluation, recommend the most appropriate OAuth 2.0 flow for the mobile health app, providing justification for your choice.

Question 4:

You are working as a developer for an online bookstore that uses a REST API to manage its resources. The current REST API has the following endpoints:

GET /books - Retrieves a list of all books with basic information (title, author, and ISBN).

GET /authors - Retrieves a list of all authors with basic information (name and author ID).

GET /books/{name} - Retrieves detailed information about a specific book, including its reviews.

GET /authors/books - Retrieves a list of books a specific author wrote.

When a client application wants to display a list of books along with their authors and the average rating of each book, it needs to make multiple requests to the above endpoints and multiple round trips to the server.

- a) Discuss how transitioning from the REST API to alternatives like GraphQL API/gRPC addresses the issue and enhances data retrieval's overall efficiency and flexibility. [2]
- b) If you chose GraphQL, provide a GraphQL schema that includes types for Book, Author, and Query type that allows fetching a list of books along with their authors and average ratings. If you chose gRPC, provide a Protocol Buffers (protobuf) definition that includes message types for Book, Author, and a service definition that allows retrieving a list of books with their authors and average ratings. [4]
- c) Include considerations of how this change impacts the client-side implementation. [2]

Question 5:

- a. Discuss the importance of browser-based APIs in modern web development. Why are they necessary for building interactive and dynamic web applications? [2]
- b. Identify and explain any three specific browser-based APIs you have used. For each example, describe its purpose and a use case scenario where it can be applied. [4]

Question 6:

Explain the POUR principles of accessibility as defined in the WCAG 2.0 guidelines. For each principle, provide one example of how it can improve web accessibility for users with disabilities. [4]

Question 7:

Imagine you're building a complex e-commerce platform with React that includes features like real-time inventory tracking, personalized user recommendations, and dynamic pricing. What are the trade-offs between using React's built-in state management (like `useState` and `useReducer`) and implementing a global state management library like `Redux`? Justify your choice to optimize performance, scalability, and maintainability in a production environment. [4]
