National University of Computer and Emerging Sciences

Web Engineering (SE3003)   # Sessional-I Exam

Date: February 27th 2024

Course Instructor

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Total Time: 1 Hours
Total Marks: 30
Total Questions: 02

Semester: SP-2024
Campus: Lahore
Dept: Software Engineering

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CLO # 1

Q1: What is HTTP and TCP/IP. Explain the 3-tier client/server architecture using an example and provide a diagram illustrating the architecture.   [15]

HTTP (**Hypertext Transfer Protocol**) and TCP/IP (**Transmission Control Protocol/Internet Protocol**) are two fundamental protocols used in computer networking, particularly in relation to the internet. HTTP is an application-layer protocol used for transmitting hypermedia documents, such as HTML files, and serves as the foundation of data communication for the World Wide Web. It defines how messages are formatted and transmitted, with web browsers using HTTP to request web pages from servers. HTTP operates in a stateless manner, treating each client-server interaction independently, and its messages are primarily text-based, making them human-readable.
On the other hand, TCP/IP is a suite of protocols governing data transmission over networks and is the basic communication language of the internet. It provides end-to-end connectivity, specifying how data should be packetized, addressed, transmitted, routed, and received at the destination. TCP/IP operates in a layered architecture with protocols like TCP and IP. TCP ensures reliable, ordered, and error-checked delivery of data between applications, while IP handles the addressing and routing of data packets across networks. Together, HTTP uses TCP as its transport layer protocol within the TCP/IP suite for reliable data delivery, enabling the seamless browsing and communication we experience on the internet.

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The 3-tier client/server architecture is a popular model for designing software applications with a clear separation of concerns. It divides the application into three interconnected layers: presentation, application (or business logic), and data storage. Here's an example to illustrate this architecture:

3-Tier Client/Server Architecture Example:
1. Presentation Layer:
This is the topmost layer that interacts directly with the end-users, handling user interface and input/output operations.
It includes components like web browsers, mobile apps, or desktop applications that users interact with.
In a web-based application, this layer often consists of HTML, CSS, JavaScript for web applications, or native UI components for mobile or desktop applications.
2. Application Layer (Business Logic Layer):
The middle layer that contains the business logic or application logic.
It processes user requests, performs computations, and communicates with the data layer for data retrieval and manipulation.
Examples of functions in this layer include user authentication, data validation, calculations, and processing business rules.
This layer is often implemented using technologies such as Java, C#, Python, or Node.js, depending on the application's requirements.
3. Data Layer (Data Storage Layer):
The bottom layer responsible for managing data storage and retrieval.
It stores and retrieves data from databases, file systems, or other data sources.
Examples of databases used in this layer include MySQL, PostgreSQL, MongoDB, or SQL Server.
Data access is usually abstracted through an Object-Relational Mapping (ORM) framework or direct database queries.

Example Scenario:
Let's consider an example of a simple online bookstore application to illustrate this architecture:

Presentation Layer:
The user interacts with the bookstore through a web browser.
The web pages are designed using HTML, styled with CSS, and enhanced with JavaScript for dynamic interactions.
Users can view book categories, search for books, add books to their cart, and proceed to checkout.

Application Layer:
When a user searches for a book, the request is sent to the application layer.
The application layer receives the search query, validates it, and processes the request.
It performs the search logic, such as querying the database for books matching the search criteria.
If the user adds a book to the cart, the application layer calculates the total price, applies any discounts, and handles the transaction logic.
This layer ensures that only authenticated users can access certain features, managing user sessions and authentication.

Data Layer:
The application layer communicates with the data layer to retrieve and store information.
Book information such as titles, authors, prices, and quantities in stock are stored in a database.
When a user searches for a book, the application layer sends a query to the database, which returns the matching results.
The data layer handles data storage and retrieval efficiently, ensuring data integrity and consistency.
Interaction Flow:
User accesses the online bookstore through the web browser (Presentation Layer).
User searches for a specific book title (Presentation Layer).
The search request is sent to the server's application layer.
The application layer processes the search request, queries the database (Data Layer), and retrieves the matching book information.
The application layer sends the search results back to the user's web browser (Presentation Layer).
User selects a book, adds it to the cart, and proceeds to checkout.
The application layer calculates the total price, checks user authentication, and updates the cart information in the database.
Finally, the user completes the purchase, and the application layer processes the transaction, updating the database with the purchase details.

A 3-tier C/S architecture
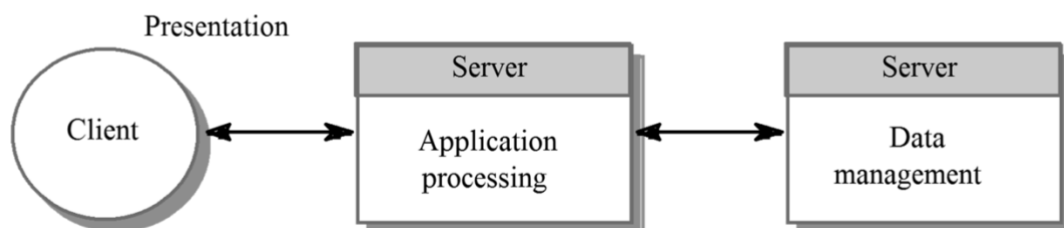
CLO #: 3

Q2: Imagine you are tasked with creating a grid system for a large screen using Bootstrap. Use a container as the starting point, then design the grid system depicted in the image below using Bootstrap classes "row" and "col". Do not apply any additional styles, use Bootstrap classes to design the grid. **[15]**
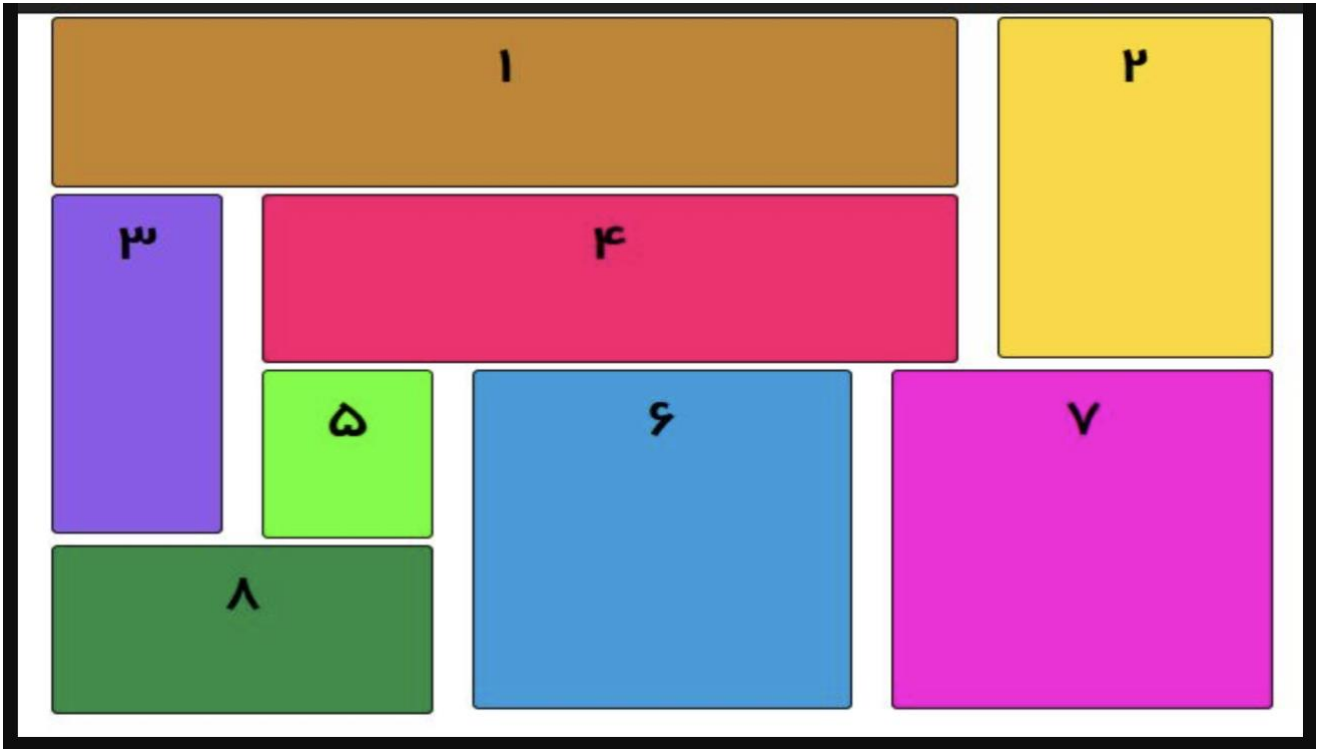
Solution without Style

```
<div class="row">
    <div class="col-md-9">1</div>
    <div class="col-md-3">2</div>
</div>
<div class="row">
    <div class=" col-md-2">3</div>
    <div class="col-md-7">4</div>
    <div class="col-md-3"></div>
</div>
<div class="row">
    <div class="col-md-2"></div>
    <div class="col-md-2">5</div>
```

```html
    <div class="col-md-4">6</div>
    <div class="col-md-4">7</div>
  </div>
  <div class="row">
    <div class="col-md-4">8</div>
  </div>
```

Solution with Style

```html
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Sessional-1</title>
  <!-- Latest compiled and minified CSS -->
<link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">

<!-- jQuery library -->
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.7.1/jquery.min.js"></script>

<!-- Latest compiled JavaScript -->
<script src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>
<style>
  .mm{
  border-radius:5px;
  border:2px solid black;
  color:black;
  font:bold 50px b yekan;
  text-align:center;
}
</style>
</head>
<body>
  <div class="row">
    <div class="col-md-9 col-sm-9 col-xs-12 pad "><div class="mm" style="height:150px;background-color:#c78221">1</div></div>
```

```
      <div class="col-md-3 col-sm-3 col-xs-12 pad"><div class="mm" style="height:300px;background-
color:#ffd800">2</div></div>
    </div>
    <div class="row">
      <div class=" col-md-2 col-sm-3 col-xs-12 pad" style="top:-150px"><div class="mm" style=" height:300px;background-
color:#9158ee">3</div></div>
      <div class="col-md-7 col-sm-6 col-xs-12 pad" style="top:-150px"><div class=" mm" style="height:150px;background-
color:#ff006e">4</div></div>
      <div class="col-md-3"></div>
    </div>
    <div class="row">
      <div class="col-md-2 col-sm-3  pad" style="top:-300px"></div>
      <div class="col-md-2 col-sm-3  pad" style="top:-300px"><div class="mm" style="height:150px;background-
color:#4cff00">5</div></div>
      <div class="col-md-4  pad" style="top:-300px"><div class="mm" style="height:300px;background-
color:#1f9cdc">6</div></div>
      <div class="col-md-4   pad" style="top:-300px"><div class="mm " style="height:300px;background-
color:#ff00dc">7</div></div>
    </div>
    <div class="row">
      <div class="col-md-4 pad" style="top:-450px"><div class="mm" style="height:150px;background-
color:#1a8d43">8</div></div>
    </div>

</body>
</html>
```