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**ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)**  
**ORGANISATION OF ISLAMIC COOPERATION (OIC)**  
**Department of Computer Science and Engineering (CSE)**

SEMESTER FINAL EXAMINATION  
DURATION: 3 HOURS

SUMMER SEMESTER, 2022-2023  
FULL MARKS: 150

**SWE 4637: Web and Mobile Application Development**

Programmable calculators are not allowed. Do not write anything on the question paper.

Answer all 6 (six) questions. Figures in the right margin indicate full marks of questions with corresponding COs and POs in parentheses.

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1. a) What is the architectural design of React, and how is it implemented? 5  
(CO1)  
(PO1)
- b) Suppose you are developing a web application that includes a form for users to sign up. The form contains fields for the user's name, email, password, and confirm password. You want to implement form validation logic to ensure that the user enters valid information before submitting the form. Additionally, you want to reuse this form validation logic in multiple components across your application. 10  
(CO3)  
(PO2)  
Implement form validation logic using custom hooks in React so that you can reuse this component.
- c) Style an HTML table with CSS having the following requirements: 5 × 2  
(CO1)  
(PO1)
- i. Center table horizontally on the page.
  - ii. Change the background color of alternating table rows.
  - iii. Align text in all table cells to the center.
  - iv. Table headers are distinguishable from table rows.
  - v. Responsive layout that adapts to different screen sizes.
2. A customer management system for a retail company called "Shopify" allows employees to create and manage customer profiles. Developers use JSON Web Token (JWT) for authorization purposes.
- a) What is JWT? What are the advantages of using JWT over session ID? 5  
(CO1)  
(PO1)
- b) How you would leverage client-side form validation libraries such as React Hook Form to streamline the process of handling form submissions, managing form state, and displaying validation errors in real-time. 10  
(CO2)  
(PO1)
- c) Explain how you would authenticate and authorize user requests to the API endpoints using JWT tokens, including the process of generating tokens upon successful login, verifying token authenticity, and protecting sensitive routes from unauthorized access. 10  
(CO2)  
(PO2)

3. a) An ExpressJS handler is always passed three arguments: two objects (`HttpRequest` and `HttpResponse`) and a function (`next`) like: `function (HttpRequest, HttpResponse, next)`
- Why ExpressJS handlers that call `HttpResponse.send()` rarely subsequently call `next`. 5 (CO1) (PO1)
  - Why a handler might contain code that modifies the incoming `HttpRequest` object and then subsequently calls the `next` function. Include an example of why this ordering might be done. 10 (CO1) (PO1)
- b) Explain why validation needs to be done in the backend, even if your frontend can do all the same validation of input and vice versa. 10 (CO2) (PO2)
4. IUT has a database of its students, including their names, IDs, majors, sessions, and contact information. The university needs a system to manage this student data efficiently.
- Describe the issues with the SQL databases that lead to web applications preferring no-SQL databases like MongoDB. 9 (CO1) (PO1)
  - Consider the above scenario and implement the following functionalities in ExpressJS with MongoDB/MySQL database: 4 × 4 (CO3) (PO2)
    - The system can add new student records to the database.
    - The system can view student records with their details. The system should provide options for sorting and filtering the student list based on students' majors and sessions.
    - The system can update the information of any student with their student ID. When it clicks the update button, the previous data will be shown on the updated form page.
    - The system can delete the information of any student with their student ID. After deleting the record, the updated information will be reflected.
5. A local library wants to create a mobile app for its patrons to browse the catalog, place holds on books, and access e-books. The library might want to offer deep links from its website that take users directly to a specific book detail page in the app. However, the library has limited resources and a diverse user base with varying device types and operating systems (Android, iOS, etc.). This app can cache essential data like library catalogs and e-books, allowing users to browse and even borrow e-books without an internet connection.
- Which type of mobile application will you consider implementing the above scenario? 5 (CO1) (PO1)
  - How would you use `ConstraintLayout` to create a responsive layout for the library catalog that adapts to different screen sizes (phones, tablets) and orientations (portrait, landscape)? 10 (CO2) (PO1)
  - How can you design activities and intents to handle deep linking and navigate users to the appropriate book details screen within the app? 10 (CO2) (PO2)

6. Assume a Ramadan app that helps users to keep track of their fasting, prayer times, and other religious observances during the holy month of Ramadan. To provide the best possible experience for users, the app needs to access data from other apps and the device itself.

When the user first installs the app, they are prompted to grant permissions for the app to access data on their device. The app requests permission to access the user's calendar app, so it can automatically add prayer times and reminders for breaking fast to the user's schedule. The app also requests permission to access the user's device data, including the time, date, and location. This allows the app to accurately calculate prayer times based on the user's location and to adjust for changes in daylight saving time.

In addition to accessing data from other apps and the device, the Ramadan app also uses its own app-specific data to provide a personalized experience for users. For example, the app may allow users to set reminders for specific prayer times or to track their fasting progress throughout the month. The app stores this app-specific data using key-value pairs, which allow the app to easily retrieve and update data as needed. The app may also share data with other apps on the user's device, such as a fitness app that tracks the user's physical activity during fasting hours.

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| a) What design guidelines do you follow to develop the Ramadan app?  | 5<br>(CO2)<br>(PO1)  |
| b) Analyze the above scenario and categorize the required permissions into different permission groups with justification. | 10<br>(CO2)<br>(PO1) |
| c) Analyze the above Ramadan app data and categorize those into different storage options. Justify your categorization.    | 10<br>(CO2)<br>(PO2) |