



**RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF TECHNOLOGY**

**Bachelor of Information and Communication Technology (Honors) Degree
Third Year - Semester II Examination – September/October 2025**

ICT 3213 – ADVANCED SOFTWARE SYSTEM DESIGN

Time: Two (02) hours

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- Answer **ALL** questions.
 - There are **FOUR (04)** essay questions printed on **TWO (02)** pages.
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01. Software Testing Fundamentals and Process

- a) What is the purpose of software unit testing, and how does it fit into the overall software development process?

[20 marks]

- b) What are the four (04) life cycle events in a test case execution? Write an example of each event with the execution order.

[40 marks]

- c) What is understood by testing pyramids? Explain it by execution time, complexity and proportion of test cases.

[20 marks]

- d) What is a *Domain* and *Domain Boundary* when considering the software scope and requirement gathering.

[20 marks]

[Total 100 marks]

02. Design Patterns and Architecture

- a) *Design patterns in programming provide us solutions for problems that we encounter in programming.*

List the three (03) classifications of design patterns? Give a brief description on each.

[30 marks]

- b) Explain the following design patterns: *Singleton*, *Decorator*, and *Observer*.

[30 marks]

- c) Discuss the advantages and disadvantages of a Design pattern of your choice. Name at least two (02) per side.

[20 marks]

- d) *"Algorithms can replace Design patterns when programming".* Discuss this statement. Do you support or against this?

[20 marks]

[Total 100 marks]

03. Software Architecture and Data Modeling

- a) *When developing any software solution, understanding the requirement and domain is an essential task.*

Explain the following terms under the theories of Software architecture: Domain, Domain Model, Code, and Programming.

[30 marks]

- b) *In the REST API, we can represent data using XML, JSON, etc. Given the "User" have attributes "First Name", "Last Name" and list of "Books". "Book" have attributes "Name" and "ISBN".*

Model sample data representation of above with given attributes. Only valid representation will be accepted as an answer.

[20 marks]

- c) Explain how we can use diagrams to make data representation easy for all stakeholders. Support your answer with the usage of Class Diagram, Flow Charts and Entity Diagrams.

[20 marks]

- d) What do you understand about Model-View-ViewModel (MVVM) architecture? Briefly explain its data flow using a diagram.

[30 marks]

[Total 100 marks]

04. Web Applications and Database Integration

- a) *When we develop large scale web applications, we need to maintain the code base in a way we can easily maintain and testable.*

What is *n-tier architecture* and its subset *3-tier architecture*? Briefly explain the *3-tier architecture* with components and responsibility of each tier.

[30 marks]

- b) Briefly explain the following REST API methods and its intended usage.

- i. POST
- ii. GET
- iii. PUT

[30 marks]

- c)
 - i. What is Object Relational Mappings (ORM)?
 - ii. What is the use case of ORM?
 - iii. What problem does ORM try to resolve?
 - iv. What are the pros and cons of using ORM in a web application?

[20 marks]

- d) Briefly explain the *Model View Controller* (MVC) components and its use cases in Web application development.

[20 marks]

[Total 100 marks]

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