Bachelor of Science (External) Second Year First Semester - 2023
2026 – January
Faculty of Science
Software Engineering
COSC 26552

No. of Questions: Four (04)	No. of pages: Four (04)	Time: Two (02) Hours

Answer ALL questions

1.

a.

    i. Why do we need software engineering? Give three (03) reasons.

(10 Marks)

    ii. List three (03) reasons for software failure.

(10 Marks)

    iii. *"Modularity is a transitional characteristic in software"*
        Is this statement true or false? Justify your answer.

(10 Marks)

    iv. Explain how software engineers use decomposition techniques to manage complex systems, using an example.

(15 Marks)

b.

    i. List the phases of the Software Development Life Cycle (SDLC).

(10 Marks)

    ii. List three (03) maintenance types in software engineering.

(10 Marks)

    iii. Discuss two (02) advantages and two (02) disadvantages of the Waterfall Model in software development.

(15 Marks)

c. The University of Kelaniya plans to develop an online Student Academic Management System. At the beginning of the project, university staff members are not fully clear about all requirements, especially how the student dashboard, course registration screens, and result views should look and behave. To better understand user expectations, the development team decides to build an initial working model of the system with limited functionality and collect feedback from students and academic staff. The system is expected to evolve based on this feedback.
Based on the above scenario,
    i. Out of the Waterfall, Prototyping, and Spiral models, which software process model is the most appropriate for this project?
    ii. Provide reasons why the other two models are not selected for this project.

(20 Marks)

2.

a.

   i.   List three (03) Agile principles from the Agile Manifesto.

(10 Marks)

   ii.   Agile methodologies are widely used in modern software development. Briefly explain three (03) advantages of using Agile methodologies.

(15 Marks)

   iii. What is a "Sprint" in Agile development, and which Agile process framework uses Sprints?

(10 Marks)

   iv. Briefly explain the responsibilities of the Scrum Master in Scrum Framework.

(10 Marks)

   v.   What is the Product Backlog in the Scrum process, and who are involved in Product Backlog refinement?

(10 Marks)

b.

   i. Why is the requirements engineering process considered a difficult task? Give three (03) reasons.

(10 Marks)

   ii. Explain the requirements engineering process, indicating its main steps.

(15 Marks)

c. The University of Kelaniya is developing an Online Library Management System to improve book borrowing and resource access for students and staff. Users can search the library catalog, reserve books online, and check due dates through the system. Notifications are sent for overdue books and upcoming reservations. Library staff can easily update book records, track borrowed items, and manage inventory efficiently. The system ensures fast response times, high availability during peak usage, and secure handling of user data. It is designed to run on both desktop and mobile devices, supported by reliable servers and network infrastructure to handle high traffic and multiple simultaneous requests. Based on this scenario,

   i. List five (05) functional requirements of this system.

   ii. List three (03) non-functional requirements of this system.

(20 Marks)

3.

a.

   i. What are the two categories of UML (Unified Modeling Language) diagrams? Provide two (02) examples for each category.

(10 Marks)

   ii. In Activity Diagrams, what is the purpose and the relevant symbol of the Fork element?

(10 Marks)

   iii. What is the benefit of using swimlanes in an activity diagram?

(05 Marks)

   iv. Briefly explain the difference between synchronous and asynchronous messages in sequence diagrams.

(10 Marks)

   v. Briefly explain the difference between required and provided interfaces in component diagrams, including their symbols.

(15 Marks)

b. The University of Kelaniya Medical Center uses a Medical Center Management System to manage healthcare services for students efficiently. Each user's basic details, such as name, email address, and phone number are stored for communication and login purposes.

Doctors have additional details, including employee ID, specialization, and assigned department. They are responsible for updating patient medical records, recording diagnoses, and prescribing treatments, while ensuring that all medical data is accurately maintained and securely handled.

Students have additional attributes, including student ID, faculty, and year of study. They can request medical consultations, view appointment schedules, and access their medical records. Each student may have only one active medical record at a time, provided they are registered with the Medical Center and comply with its healthcare policies.

The system maintains information about medical appointments, including appointment ID, consultation date, attending Doctor, and appointment status (scheduled, completed, or cancelled). Details of each medical record are recorded, including record ID, symptoms, diagnosis, prescribed medication, and record status, and each record is linked to a specific student and Doctor. The Medical Center Management System ensures efficient healthcare service delivery by organizing user information, maintaining accurate medical records, and streamlining appointment scheduling and consultations.

Based on the above scenario,

    i. Draw the class diagram, including the attributes and methods of each class, along with their relationships.

    ii. Draw the use case diagram including the main roles of the system.

(Note: Clearly state any assumptions you make while drawing the above diagrams)

(50 Marks)

4.

  a.

    i. List three (03) basic principles that are applied during software design.

(05 Marks)

    ii. What are the two main types of Version Control Systems (VCS)? Provide an example for each type.

(10 Marks)

    iii. Explain the difference between the bottom-up and top-down approaches.

(15 Marks)

  b.

    i. List two (02) automation testing tools used in the software industry.

(05 Marks)

    ii. *"White-box testing is a software testing method where testers assess the functionality of an application without knowing its internal code or structure."*

       Is this statement true or false? Justify your answer.

(10 Marks)

iii. Briefly explain the following terms related to software testing.
    A. Unit Testing.
    B. Integration Testing.
    C. User Acceptance Testing.

(15 Marks)

c.

i. List three (03) benefits of software project management.

(05 Marks)

ii. Briefly explain the Product Breakdown Structure in project planning.

(10 Marks)

iii. List three (03) quality monitoring techniques in project monitoring and briefly explain one of them.

(15 Marks)

iv. List three (03) ethical issues encountered in the software industry.

(10 Marks)

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