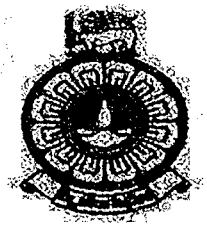
00392

THE OPEN UNIVERSITY OF SRI LANKA
B.SC(IT) DEGREE PROGRAMME
LEVEL 03
COU3202 – System Analysis and Designing
Final Examination: 2026/2027
Duration: Two hours only (02 hours)



Date: 26.06.2025 Time: 9.30 am – 11.30 am

INSTRUCTIONS TO CANDIDATES

- Carefully read all the instructions given below.
- This paper contains **Five (05)** questions in **four (04)** pages.
- You **must answer question 01** and select any **three (03)** questions out of question 2 – 5.
- Paper duration is **two hours**.
- Each main question must begin on a new page.
- Use **blue** or **black** ink pen to write answers.

Question 01 - (40 marks)

Read the below case study and answer the questions given below.

NeuroMira HealthTech is a South Korean medical technology company specializing in Artificial Intelligence AI-based diagnostic solutions. The company plans to develop a cloud-based platform called BrainScan AI that assists radiologists and neurologists in detecting brain tumors from MRI and CT scan images. Currently, radiologists manually analyze hundreds of medical images daily. This process is time-consuming and may lead to delayed diagnosis, especially in hospitals experiencing staff shortages. BrainScan AI aims to improve diagnosis speed and accuracy by using machine learning algorithms to analyze medical images and provide risk assessments to doctors. The system will not replace doctors. Instead, it will act as a decision-support system.

The hospitals demands the projects needs to be released within 18 months after the agreement signing and completed with budget of USD 4.5 million. Yuna Kim is responsible for gathering requirements from hospitals, doctors, and regulatory authorities. The system has several features such as uploading scans, analyzing scans and generating reports. Three months after deployment, hospitals reported that MRI images larger than 1.5 GB occasionally fail during upload. As a result, some scans remain in a "Processing" state indefinitely. Technical support has identified possible issues related to cloud storage integration and API timeout configurations. Due to the sensitive nature of medical information, all patient data must be encrypted during storage and transmission. The system is expected to be available 24 hours a day with a minimum uptime of 99.9%.

i. What is the input element of this decision-support system? *(2 marks)*

ii. What are problems in the manual hospital system workforce according to the case study which leads to have an AI based decision-support system? *(3 marks)*

iii. What is the role played by Ms. Yuna Kim inside Software Development Life Cycle? *(2 marks)*

iv. What is the mechanism used by the company to check whether the project can be completed within the given time frame and budget? *(2 marks)*

v. What are known as functional requirements? *(2 marks)*

vi. Identify the maintenance type that resolved the problem identified by the technical team and give reasons for your selection. *(5 marks)*

vii. Suggest three possible requirement gathering techniques that can be used by Ms. Kim to identify requirements. *(6 marks)*

viii. Identify the functional requirements given in the case study for BrainScan AI. *(6 marks)*

ix. Based on the functional requirements you mentioned in (viii) why you think non-functional requirements are also so vital for a system as much as functional requirements. *(6 marks)*

x. The project team debate over agile vs waterfall method as the software process model for the development. As an undergraduate student which process model would you propose and why would you select it? *(6marks)*

Select any three questions from below and answer.

Question 02 ***[20 marks]***

i. What is known as a software development model? *(3 marks)*

ii. List down the phases of the SDLC. *(4 marks)*

iii. Briefly explain how functional requirements differ from non- functional requirements. *(5 marks)*

Software architects suggests that AI algorithms and regulations may update over time, and additional hospital requirements can arise.

iv. Which architectural principle explains this nature and briefly explain it. *(8 marks)*

Question 03 ***[20 marks]***

i. What is known as a Software Requirement Specification? *(3 marks)*

The BrainScan AI system includes multiple components such as AI-based image analysis, patient management, secure authentication, reporting modules, and cloud storage integration. The Software Architect; Seojun Choi, is considering different system design approaches to structure the development process efficiently. Engineers prefer building individual modules first and then integrating them into a complete system.

ii. What is known as "*bottom-up*" strategy? *(4 marks)*

iii. Draw the bottom-up strategy diagram for the BrainScan AI system. *(5 marks)*

iv. *"Primary objective of input design include ensuring the quality, accuracy, and timeliness of data".*

As a systems analyst, explain the mechanisms that you can use to ensure it. *(8 marks)*

Question 04 **[20 marks]**

Answer the questions below based on the scenario given below.

NeuroMira HealthTech develops a module called *ScanFlow Manager* as part of the BrainScan AI platform. The purpose of this module is to manage MRI/CT scan uploads, processing, AI analysis, and report generation. The radiologist uploads the scan to BrainScan AI. The system validates the file format and file size before storing it in secure cloud storage. If the scan fails validation, the system displays an error message and requests the radiologist to upload a valid file. If validation succeeds, the scan is encrypted and stored in cloud storage. Once uploaded successfully, the AI engine retrieves the scan and analyzes the images to generate a tumor risk assessment report.

i. Explain who are known as *"Actors"* in a use case diagram. *(3 marks)*

ii. What are *"swimlanes"* in an activity diagram? *(4 marks)*

iii. Briefly explain how use case diagrams can help to understand functional requirements. *(5 marks)*

iv. Draw the activity diagram for the scan uploading process. *(8 marks)*

Question 05 **[20 marks]**

Answer the following questions based on the scenario given below.

The system maintains information about Patients, including a unique patient ID, name, date of birth, gender, and contact number. A patient may undergo multiple MRI or CT scans over time. Therefore, one Patient can be associated with many Diagnostic Cases, while each Diagnostic Case belongs to only one Patient. Each Diagnostic Case contains a case ID, creation date, status, and priority level. A Diagnostic Case is created when a radiologist uploads a medical scan for analysis.

i. What are the two main UML diagrams types? *(3 marks)*

ii. What are the four relationships in a class diagrams and draw them. *(4 marks)*

iii. How are sequence diagrams different from state diagrams? *(5 marks)*

iv. Draw the two classes which are "*patient*" and "*diagnostic case*". *(8 marks)*

********** All Rights Reserved **********