

UNIVERSITY OF RUHUNA
BACHELOR OF COMPUTER SCIENCE (GENERAL) DEGREE EXAMINATION
LEVEL I (SEMESTER II)
NOVEMBER/DECEMBER - 2016

Subject: Computer Science

Course unit: CSC1242 (Object-Oriented Systems Design)

Duration: 2 Hours

Answer All four questions.

1.

a. Which of the following statements most appropriately describes design phase in object-oriented systems development?

- i. it emphasizes collecting requirements.
- ii. it emphasizes analyzing the problem(s).
- iii. it emphasizes conceptual solutions to the problem(s).
- iv. it emphasizes conducting surveys.

(05 marks)

b. Which of the following statements is true regarding encapsulation?

- i. Encapsulation describes the relationship between two subclasses.
- ii. Encapsulation is about organizing operations and data within the same object.
- iii. Encapsulation allows other objects to change private operations and data of an object.
- iv. Encapsulation makes the internal implementation details of an object visible to other objects.

(05 marks)

c. State whether the following statements are true or false.

- i. In Unified Process vertical axis shows how activities/content changes during the development process.
- ii. Defining the project scope is mostly done in the inception phase in the Unified Process.
- iii. Resource estimation and project planning is a part of the inception phase in the Unified Process.
- iv. Evaluation of the stability of the outcomes of the inception phase is a major concern in the Elaboration phase.
- v. Activity diagrams cannot be used in business modelling discipline in the Rational Unified Process.
- vi. System development Life Cycle (SDLC) activities are not considered in iterative and incremental system development process.
- vii. RUP primarily uses models to manage requirements.
- viii. Flexibility of crafting building blocks, required to develop software, has made the development process less complex.
- ix. UML can be used to build informal models, formal models and as a programming language in the systems development.
- x. Rational Unified Process is a development process that collects best practices in software development.

(30 marks)

d. In the Rational Unified Process, activity diagrams can be used to model different aspects of a system. Briefly explain these aspects.

(30 marks)

e. The newly built computer science auditorium is to be fitted with a system to monitor temperature, light and sound levels of it.

- i. Identify three key abstractions from the above case?
- ii. Give two responsibilities that could be associated with any of the abstractions you have identified in (i) above.

(30 marks)

2.

a. What is the primary difference between a class and an object with respect to object-oriented system development?

(10 marks)

b. BCS and BSc are names of two undergraduate level general degree programs offered by the faculty of science. Each of these degree programs consist of different course units. Each course unit has a course code (e.g. CSC1213) and title (Data Structures and Algorithms). These course units are offered by different departments of the faculty. Each department has a name and a department code. At the beginning of a semester students must register for course units they wish to follow during the semester. Each student is given a registration number to uniquely identify them. The faculty wishes to build a system to manage above information.

- i. Give two examples of classes and their corresponding objects from the above description.
- ii. Construct a domain model by identifying classes and their attributes only by considering the above description.

(60 marks)

c.

i. Vision document is an artefact created in the inception phase of the Rational Unified Process (RUP). Briefly explain the purpose of creating a vision document at the initial stage of the systems development?

(20 marks)

ii. Write two artefacts, other than vision document, that are created in the inception phase of RUP.

(10 marks)

3.

a. Briefly explain how use cases contribute to the systems development.

(10 marks)

b. What is a use case scenario? Give an example.

(10 marks)

c. Briefly explain “*extend*” and “*include*” associations used in use cases by giving examples for each association.

(20 marks)

d. Consider the following business description.

At the end of each semester, the faculty prepares to conduct end-semester examinations. As a part of preparation, Heads of Departments (HoDs) are requested to appoint examiners for course units offered by departments during the semester. Also a committee is appointed to prepare the examination time table by the Dean of the faculty. Heads of departments are also asked to set cut-off levels to attendance to decide the student examination eligibility. Once the examination eligibility is determined the Assistant Registrar of the faculty issues the examination admission card. After receiving the admission card students sometimes submit appeals requesting permission to sit for course unit examinations that are indicated as not eligible in the issued admission card. Student can submit appeals to either to HoDs or to the Dean.

i. Identify user goals from the above description and prepare actor-goal list (proper naming is required to obtain full marks).

(27 marks)

ii. Draw a UML use case diagram for the goals you written in d (i) above.

(18 marks)

iii. Give an example of a use case scenario from the business description given above.

(15 marks)

4.

a. Which of the following artefacts are used to model system behavior?

- i. System sequence diagram
- ii. Class diagram
- iii. Use case
- iv. Operations contracts

(05 marks)

b. Consider following descriptions about two classes. The first class has the following operations: `getStudyProgram()`, `getStudentID`, `getGrade()`, `getTotalCredits()`, and `findGPA()`. The second class has the following operations: `getStudentID`, `getCourseCode()`, `getGrade()`, `findGPA()`, `findMinimumGrade()`, and `findMaximumGrade()`. The two classes share the same superclass. Which of the following answers lists the operations that are most likely to be contained in the superclass?

- i. `findMaximumGrade()`, `findMinimumGrade()`, `getGrade()`, and `getTotalCredits()`
- ii. `getStudentID()`, `getGrade()`, and `findGPA()`
- iii. `getStudentID()`, `getStudyProgram`, `getCourseCode`, `getGrade()`, and `findGPA()`,
`getCourseCode()`, `getGrade()`, `getTotalCredits()`, and `findGPA()`

(05 marks)

c. Consider the following brief use case description regarding an online examination.

“the student has to authenticate himself or herself in order to take the examination. The system validates student’s account and welcomes the student for the examination. There are several examinations and the student will have to select the examination he /she wishes to take. Depending on the examination selected by the student, the system selects the questions from the question base according to a predetermined strategy. The system ends the examination either after the student answered the questions within the given time or when the examination time ends. The system then evaluates the student’s answers and presents the grades to the student. The system also records test results for the student.

i. Write the above use case in the **fully dressed format**. Use an appropriate use case name. Your answer should include the sections: Use Case Name, Primary Actor, Basic Flow and Extensions.

(60 marks)

ii. Use UML activity diagram to model the workflow of the use case given above.

(30 marks)
