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| **National University of Computer and Emerging Sciences, Lahore Campus** | | | | |
| C:\Users\saif\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\final design.jpg | **Course Name:** | **Software Design & Analysis** | **Course Code:** |  |
| **Degree Program:** | **BS (CS)** | **Semester:** | **Fall 2021** |
| **Exam Duration:** | **90 min** | **Total Marks:** | **30** |
| **Paper Date:** | **30-Nov-2021** | **Weight** |  |
| **Section:** | **ALL** | **Page(s):** | **3** |
| **Exam Type:** | **Mock up Mid-2** |  |  |
| All the questions carry equal marks. No separate answer sheets required. Rough sheet are allowed, however. Do not attach additional sheets with this question paper. | | | | |

**Question 1**

Following is a description of a behavior of an alarm clock:

User can set or cancel an alarm. When user sets an alarm, the clock displays a bell sign; the sign disappears when user cancels. Once set, the alarm goes off at the specified time. Now the user can either dismiss alarm or can snooze it. If dismissed the alarm is cancelled, otherwise it rings again after 10 minutes. In case the alarm is ringing and the user does not respond for a whole minute, the alarm is automatically snoozed.

Give a UML state diagram for the afore-mentioned alarm clock.

**Question 2**

Following is detail of a PhD program at a local university:

Student needs to pass a course work of 18 credit hours. He must score a GPA of at least 3.0. Afterwards he is required to pass a comprehensive exam. Next he needs to defend PhD synopsis (research proposal). Then he has to publish a paper in a recognized research journal (magazine). Afterwards his thesis is evaluated by two foreign and two local experts. These evaluations by experts can be done in parallel. Finally the candidate appears in a public defense (thesis presentation). If successful he gets the degree.

Give a UML activity diagram for the afore-mentioned process.

**Question 3**

Consider a class having two functions: foo and bar. There are two clients: client1 and client2.



Client1 uses only foo() while client2 uses only bar. Secondly in future we may need to replace class A with another class B, which also provides foo and bar. Now redesign the system in the light of the SOLID principles.

**Question 4 and 5**

You are asked to develop a software system to solve the following problem:

There is a gap between skills required by the industry and skills being taught in the universities. A system needs to be developed that would help narrow this gap. The system should be able to collect required skills from industry and map them to university curriculum for pointing out gaps. You can assume that the required data about skills is available from industry and data about curriculum is available from academia that can be fed into the system. The challenge is to map the industry’s skills requirements to the academia’s curriculum. There is no one to one mapping available. However there are certain high level areas in which the skills can be categorized (e.g. Web Development, Mobile App Development, Automated Testing, Business Analysis, Software Design, Machine Learning etc.). One skill can be categorized into more than one skill-area. These skill-areas are then mapped to the curriculum taught by academia. Curriculum has courses that in turn have Objectives. One objective can fall into multiple courses.

In order for the skill to have a matching objective, it’s area must match a particular course within the curriculum and then the skill must match a particular objective within that course.

There is a service available that can tell if an area is related to a particular course. There is another service that can tell if a skill is related to a particular objective within a course.

Q4) Prepare a class diagram for the above scenario after identifying appropriate abstractions that will participate to provide required business logic. Identify at least 5 abstractions along with their relationships (e.g. association/aggregation/composition and generalization). Use association names and association end names where needed. Also show multiplicity.[Note: there is no need to write attributes and functions.]

Hint: read Q4

Q5) Prepare a sequence diagram for the following use case showing interactions between abstractions identified in the class diagram.

UseCase: Is skill covered by the curriculum?

* 1. Given a skill find out if it is being covered in the curriculum. Remember how the skills are categorized into skill-areas which are then mapped to courses and finally skills are matched to objectives within courses. Make use of two services mentioned in the description of the problem.