National University of Computer and Emerging Sciences, Lahore Campus

	Course Name:	**Software Design & Analysis**	**Course Code:**	
	Degree Program:	**BS (CS)**	**Semester:**	**Fall 2020**
	Exam Duration:	**90 min**	**Total Marks:**	**40**
	Paper Date:	**19-Oct-2020**	**Weight**	
	Section:	**ALL**	**Page(s):**	**2**
	Exam Type:	**Mid-1**		

All the questions carry equal marks. Solve the objective question on this sheet.

Q1) Answer the following MCQ's:

1) Composition is

a. a special type of association
b. a special type of aggregation
c. a special type of inheritance
d. a special type of generalization
e. is very different from aggregation, inheritance, or generalization

2) Which of the following statement is incorrect?

a. Circle inherits Shape
b. Circle inherits Sphere
c. Lion inherits Mammal
d. Snake inherits Reptile
e. Bus inherits Vehicle

3) In the diamond problem

i. a child class may inherit multiple copies of a data member
ii. a class has a function named "diamond"
iii. child class uses aggregation
iv. parent class uses composition

6) What will be the multiplicity/cardinality between classes Author and Book:

a) One to one
b) One to many
c) Many to many
d) Many to one
e) Two to five

7) Which type of inheritance is not supported by java?
(a) single (b) multiple
(c) multi-level (d) hierarchical (e) public

8) A class in Java can inherit from

i) a single class

ii) multiple classes

iii) a single interface

iv) multiple inhterfaces

(a) i and ii only (b) all of above (c) ii and iii only

(d) ii and iv only (e) iv only

(a) i (b) ii (c) iii (d) iv (e) iii and iv only

4) Pick the odd one out:

a) Inheritance

b) Polymorphism

c) Association

d) Aggregation

e) Composition

5) Which of the following are part-whole relationships:

i. Simple association

ii. Aggregation

iii. Composition

iv. Inheritance

v. Polymorphism

(a) iv and v (b) iv (c) i (d) iii e) ii and iii

9) The vertical dimension of a UML sequence diagram shows

a) abstract b) line c) Time
d) messages e) space

10) A good abstraction hides _____ , and provides easy-to-use _____.

a) implementation details; interface
b) interface; implementation details
c) data members; functions
d) gold; tools
e) inherited data members; classes

Q2) Video-Rental Ltd. (VRL) is a small video rental store. The store lends videos to customers for a fee, and purchases videos from a local supplier. They need a computerized system that helps them run their daily business. Description of their daily business is as follows:

Only a registered customer can borrow videos from the store. New customers register by filling out a form with their personal details and credit card details. The credit card details are used to pay subscription fee, video borrowing fees, and overdue fines. On successful payment of subscription fee, the customer is issued a membership card by VRL. The membership card has a unique membership id which is later used when borrowing videos. Each new customer's form is also added to the customer file. A customer can request a video by providing video title, his/her membership id, and payment – payment is always with the credit card used to open the customer account. If the payment is successful the customer is handed over the video by VRL. The customer then returns the video to the store after watching it. If a loaned video is overdue by a day the customer's credit card is charged, and a reminder letter is sent to the customer. Each day after that a further transaction on card is made, and each week a reminder letter is sent. This continues until either the customer returns the video, or the charges are equal to the cost of replacing the video. The local video supplier sends a list of available titles to VRL, who decides whether to send the supplier an order and payment. If an order is sent then the supplier sends the requested videos to the store. For each new video a new stock form is completed and placed in the stock file.

Draw the use-case diagram for the above scenario.(Note: Use "include" and "extend" where required.)

Question 3 and 4

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.

Q3) 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

Q4) 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?

0. 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.