

**ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)**  
**ORGANISATION OF ISLAMIC COOPERATION (OIC)**  
**Department of Computer Science and Engineering (CSE)**

SEMESTER FINAL EXAMINATION  
 DURATION: 3 HOURS

SUMMER SEMESTER, 2022-2023  
 FULL MARKS: 150

**SWE 4201: Object Oriented Concepts I**

Programmable calculators are not allowed. Do not write anything on the question paper.

Answer all 6 (six) questions. Figures in the right margin indicate full marks of questions with corresponding COs and POs in parentheses.

1. a) Define abstraction using a real life example. How would you represent abstraction in object oriented programming language. 5  
(CO1)  
(PO1)
- b) Differentiate pass-by-value and pass-by-reference? How does Java achieve pass-by-reference using pass-by-value? Give an example. 6  
(CO2)  
(PO2)
- c) Alan Turing, a pioneering mathematician and computer scientist, is known for his work in breaking the German Enigma code during World War II, a breakthrough that greatly aided the Allies. His conceptualization of the Turing machine laid the foundation for modern computing and artificial intelligence. Tim Berners-Lee, another pioneer scientist, invested world wide web. 6  
(CO2)  
(PO1)  
 Identify 4 objects from the paragraph. For each of the objects, mention which type (i.e., class) the object belong to. You may identify multiple objects of same type. Note that, the type of object may or may not be mentioned in the paragraph.
- d) You have to write a program to manage the status of Curriculum Vitae (CV) submissions. Each CV must have a status. Table 1 contains the information for different status. A new status can be added any time. You want to enforce that the new status should have a different index and message. Propose a solution code in your preferred programming language. 8  
(CO4)  
(PO1)

Table 1: A table containing CV status for Question 1.d

Status	Index	Message
PENDING	1	CV status is pending
FORWARDED	5	CV has been forwarded
CONFIRMED	10	CV is confirmed for placement

2. Consider you are developing a voting system. Any person of Bangladesh whether male, female or other can participate in the voting. A person could be a voter or a candidate. A voter must be at least 18 and a candidate must be at least 35 years old. A voter has NID as well. A voter can vote only if they have not voted yet and vote for only one candidate. For each vote, the respective candidate's number of votes will be increased by one. Each candidate has a position (e.g., President, Vice President, etc.) to compete in the election and number of votes received (initially 0). Each candidate can run a campaign for the election. Moreover, each candidate should follow an external election policy considered as a contract for them. The voting system holds the list of voters and candidates, adds/removes them, and elects the candidate. The candidate who gets the highest number of vote will be elected for that position.
  - a) Draw an UML class diagram, with proper details of each class, its properties and methods, and relations. 20  
(CO3)  
(PO2)

- b) If any candidate is not 35 years old and not a Bangladeshi, an ineligible candidate exception will be thrown. Write a program for throwing the custom exception.
3. a) Differentiate between checked and unchecked exceptions with an example.
- b) Table 2 contains some data saved in `university.txt` file. The data is separated using different separators (e.g., comma, semicolon, etc). The file is located in `C:\Users\Username\Documents` folder. Write a program to read the data from the file.

5  
(CO2)  
(PO1)

6  
(CO1)  
(PO1)

10  
(CO4)  
(PO1)

Table 2: A table containing students data for Question 3.b.

ID	Name	CGPA
120 ;	Alice ,	3.50
145 ;	Bob ,	3.80
160 ;	Severus Snape ,	3.99

- c) You have to write a GUI application that can show different messages on different weekdays on button clicks. For example, "Saturday: Good day to sleep!", Monday: Study hard!" and for other days "Enjoy your day!". Figure 1 shows a sample output of the code. Write appropriate program to build the application.

12  
(CO2)  
(PO2)



(a) First GUI screen



(b) Second GUI screen

Figure 1: Sample output for Question 3.c

4. a) Table 3 represents a partially complete class card. Provide constructive feedback regarding the cohesion of the class. Re-design and complete the class card by following UML notations.

10  
(CO3)  
(PO2)

Table 3: A class card for Question 4.a

Product
name:
price: double
quantity:
invoiceNumber:
date:
customerName:
customerAddress: String
addProduct(Product product):
totalAmount(): double
getPrice():
printDetails(): void

- b) How does method overloading differ from method overriding? Give example. 6  
(CO1)  
(PO1)
- c) What is the purpose of clean code? Write five clean code practices. 6  
(CO1)  
(PO1)
5. a) Explain the following concepts with an example: 5 + 5  
i. Wrapper class (CO1)  
ii. Type casting (PO1)
- b) What is the purpose of using final keyword in Java? Provide one example of each of the 3 different use cases for final. 7  
(CO1)  
(PO1)
- c) For each of the following lines of Java code, describe it by showing the package, class, and method structures of the actual code. 4 + 4  
(CO2)  
(PO1)
- i. import java.awt.event.ActionListener;  
ii. System.out.println("Hello World");
6. a) Consider Code Snippet 1 which contains a section of Java program that has several errors. 20  
(CO4)  
(PO1)

```

1 class Phone {
2     private String phoneNumber;
3
4     public Phone(String phoneNumber) {
5         this.phoneNumber = phoneNumber;
6     }
7     public void call(String toNumber) {
8         System.out.println("Calling from " + phoneNumber + " to " +
9             toNumber);
10    }
11 interface SmsCapable {
12     void sendSms(String toNumber, String text);
13 }
14 class MobilePhone extends Phone implements SmsCapable {
15     public MobilePhone(String phoneNumber) {
16         super(phoneNumber);
17     }
18     @Override
19     public void sendSms(String toNumber, String text) {
20         System.out.println("Texting from " + phoneNumber + " to " +
21             toNumber);
22         System.out.println(text);
23     }
24     public void call(String toNumber, boolean isVideoCall) {
25         if (isVideoCall)
26             System.out.println("Video Calling from " + phoneNumber +
27                 " to " + toNumber);
28         else
29             super.call(toNumber);
30     }
31 }

```

```

30 abstract class Radio {
31     public void play(String channel) {
32         System.out.println("Playing " + channel);
33     }
34 }
35 class AndroidPhone extends MobilePhone {
36     public AndroidPhone(String phoneNumber) {
37         super(phoneNumber);
38     }
39     public void connectToInternet(String wifiName) {
40         System.out.println("Connecting to " + wifiName);
41     }
42 }
43 class Main {
44     public static void main(String[] args) {
45         Radio r = new Radio();
46         r.play("12.8");
47
48         MobilePhone m = new MobilePhone("0123456789");
49         m.sendSms("0123456789", "Hello!");
50
51         AndroidPhone a = new AndroidPhone("9876543210");
52         a.connectToInternet("HomeWifi");
53     }
54 }

```

Code Snippet 1: An erroneous Java program for Question 6 a

Write the location of 5 errors in the code by mentioning the line number or line range. Explain why you believe there is an error at that location and write the correct code. When considering a single line, assume that rest of the code has **no** errors.

b) What is the purpose of access modifiers? List down all the access modifiers.

5  
(CO1)  
(PO1)