COMSATS University Islamabad, Abbottabad Campus

Department of Computer Science

Final Term Exam

FALL 2024

Reviewed 8/1/202

Class: BSE 6A,6B AND 6C

Subject: Software Construction and Development

Instructor: Hifza Ali

Total Marks: 50

Date: 20th January 2025

Name:

Registration No:

CLO-1	Outline the concepts of software construction and management	Understanding
CLO-2	Illustrate best software construction practices	Applying
CLO-3	Demonstrate the concepts involved in development of concurrent programs.	Applying
CLO-4	Apply testing and exception handling techniques on concurrent systems.	Applying
CLO-5	Construct design models for problems based on real world scenarios.	Applying

Question No 1: [CLO-1] **Marks 5**

Discuss the Design Principles which must be followed to design a Smart Home Automation System with Minimal Complexity and Anticipation for Change.

Question No 2: [CLO-2] **Marks 7.5**

Modify the following set of codes to get a refactored code eliminating the mentioned code smells.

a. **Long Method**

```
def process_order(order):
    print("Processing order")
    total = 0
    for item in order:
        print(f"Processing item: {item['name']}")
        total += item['price']
    if total > 100:
        print("Applying discount")
        total *= 0.9
    print(f"Order total: {total}")
```

b. **Parallel Inheritance**

```
class Car:
    def drive(self):
```

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```
        print("Driving a car")

    class CarMechanic:
        def repair_car(self, car):
            print(f"Repairing a {car}")
```

c. Feature Envy

```
class Address:
    def __init__(self, street, city):
        self.street = street
        self.city = city

class User:
    def __init__(self, name, address):
        self.name = name
        self.address = address

    def print_address(self):
        print(f"{self.address.street}, {self.address.city}")
```

Question No 3: [CLO-3] **Marks 10**

Demonstrate the working of a Concurrent Server and respective client with the help of a diagram, clearly elaborating all the method calls involved for connection establishment, service exchange and connection termination.

Question No 4: [CLO-4] **Marks 10**

Construct a flowchart to represent and elaborate the working of a Completable Intended Modifications Non-Blocking Algorithm for Concurrent Applications. Also discuss its benefits as compared to Optimistic Locking Algorithm.

Question No 5: [CLO-4] **Marks 7.5**

A movie theater has 100 seats. Multiple users try to book tickets simultaneously. If two users book the last seat at the same time, both could get confirmation, leading to an overbooked seat. Explain all possible characteristics that should be added to get a thread safe concurrent application to avoid this problem.

Question No 6: [CLO-5] **Marks 10**

Consider a Tutor Finder Web based application that will allow students and parents to find teachers in their vicinity according to their subject requirements. The system will enable teachers to register themselves in the system through web-based interface. The teacher will enter its profile information and portfolio along with the subject of expertise and available tuition slots. The students and parents will be able to search for tutors for a course or topic. The main functionality lies in providing feedback for tutors by students/parents. Feedback will be provided both in terms of text and ratings. Based on comments/ ratings the parents will be able to select the tutor. Moreover, in addition to subject based expertise, topic-based expertise and feedback can also be incorporated. The application will allow students/teachers to schedule the tuition time based on available slots. The system will incorporate online payments.Sketch a level 0, Level 1 and Level 2 DFD for the system

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