B.Sc. Engg. SWE 5th Semester — 05 October 2022 (Morning)

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

MID SEMESTER EXAMINATION — **WINTER SEMESTER, 2021-2022**

DURATION: 1 HOUR 30 MINUTES — **FULL MARKS: 50**

SWE 4501: Design pattern

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

Answer **all 3 (three)** questions. Marks of each question and corresponding CO and PO are written in the right margin with brackets.

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1. a) What are the main components of OOP? Explain the statement "classes should be open for extension and closed to modification" with proper example. — 1+3 (CO1) (PO1)

   b) Consider the following scenarios and write down the name of the design pattern or principle that would be the most appropriate for each of them. — 3 (CO4) (PO2)
   - i. You are building a system that relies on a complex algorithm, and that algorithm may be changed often due to marketing pressures.
   - ii. A pizza factory produces pizzas with various toppings. There are 20 different toppings and a customer may order any combination of toppings. Assume that each of pizza bread and each topping will be represented by a different class.
   - iii. We are building a cricket app that notifies viewers about the information such as *current score, run rate* etc. Suppose we have made two display elements **CurrentScoreDisplay** and **AverageScoreDisplay**. **CricketData** has all the data (runs, bowls etc.) and whenever data changes the display elements are notified with new data and they display the latest data accordingly.

   c) Explain a scenario where the Adapter Pattern can be used. Write the corresponding code for that scenario. Also, draw the UML diagram for that scenario. — 8 (CO4) (PO2)

2. a) Briefly, explain the purpose of the "Decorator Pattern". List three distinct advantages of factory methods over constructor. — 3 (CO3) (PO1)

   b) Identify a pattern which can define a one-to-many dependency between objects so that when one object changes its state, all of its dependents are notified and updated automatically. Briefly explain that pattern. Also discuss the advantages and disadvantages of that pattern. — 5 (CO3) (PO1)

   c) Draw a UML diagram for the Mediator Pattern between web services and web clients. Consider the web services Ebay auction house and Amazon, plan functions to search for an item with a textual description, and to buy an item from the service that gives you the best price. — 2+5 (CO4) (PO2)

3. a) Explain a pattern satisfying the statement (program to an interface, not to an implementation) with real world scenario. — 7 (CO4) (PO2)

   b) Which design pattern uses composition to extend the capabilities of an object at runtime? Explain a scenario satisfying that pattern. Draw an UML diagram for that scenario. — 2+5+5 (CO4) (PO2)

   c) Differentiate between: — 3 (CO3) (PO1)
   - i. Method Overloading and Overriding
   - ii. Prototype and Singleton
   - iii. Coupling and Cohesion