National University of Computer and Emerging Sciences, Lahore Campus

Course:	Software Design & Analysis	Course Code:	CS3004
Program:	BS (CS)	Semester:	Fall 2023
Duration:	60 Minutes (1 Hour)	Total Marks:	30
Paper Date:	11-Nov-23	Weight	15%
Section:	All	Page(s):	4
Exam:	Sessional II		

Instruction/Notes:

Attempt all questions on the question paper. Neither use nor submit any extra sheet.

Name: SOLUTION Roll Number: _____ Section ____

Question 1 (Max. Marks = 15 = 5 + 10) [CLO 4]

A cricket-based mobile game - FASTCric - is designed in such a way that after a bowler delivers a ball to a batter, the batter's play function is called. This play function has two parameters i.e. ball type (leg spin, off spin, yorker, or bouncer) and ball speed (km/hour). This function decides which type of shot is played by the batter using the following rules:

- if leg spin or off spin is bowled, the batter plays the sweep shot
- if yorker is bowled, the batter plays the block shot
- if bouncer is bowled and ball speed is less than 80 km/hour and batter's energy level is at least 70%, then hook shot is played
- in all other cases, the leave-it-alone shot is played.

All types of shots keep track of the runs scored when they were played and the play function also returns the runs scored. A sweep shot always result in 4 runs while a hook shot always results in six runs. Both block shot and leave-it-alone shot result in 0 runs.

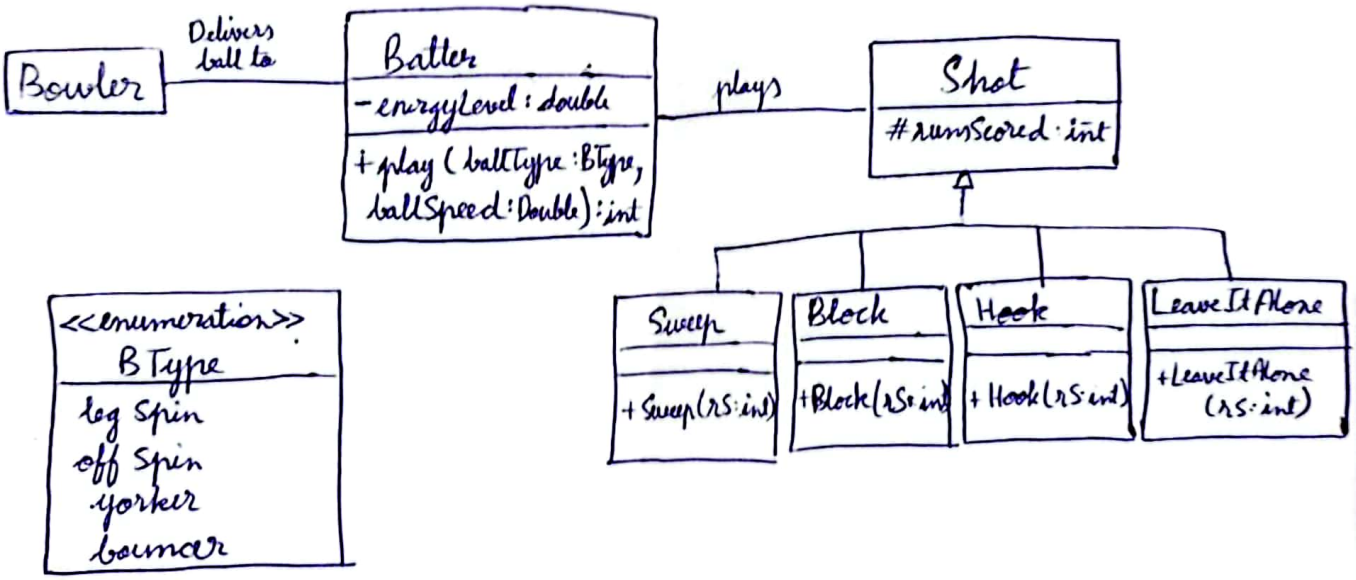
Model the information provided above using

a. a UML 2 **design class diagram** depicting a portion of the design of FASTCric
Important Instructions: This diagram should have exactly 7 classes (including Bowler, Batter, and Shot) and exactly 1 enumeration.

b. a UML 2 **design sequence diagram** depicting the "Play Ball" use case for the Batter actor.

Ensure consistency between these two diagrams.

[Use the space below on this page for answering Question 1a (UML 2 **design class diagram**) only.]

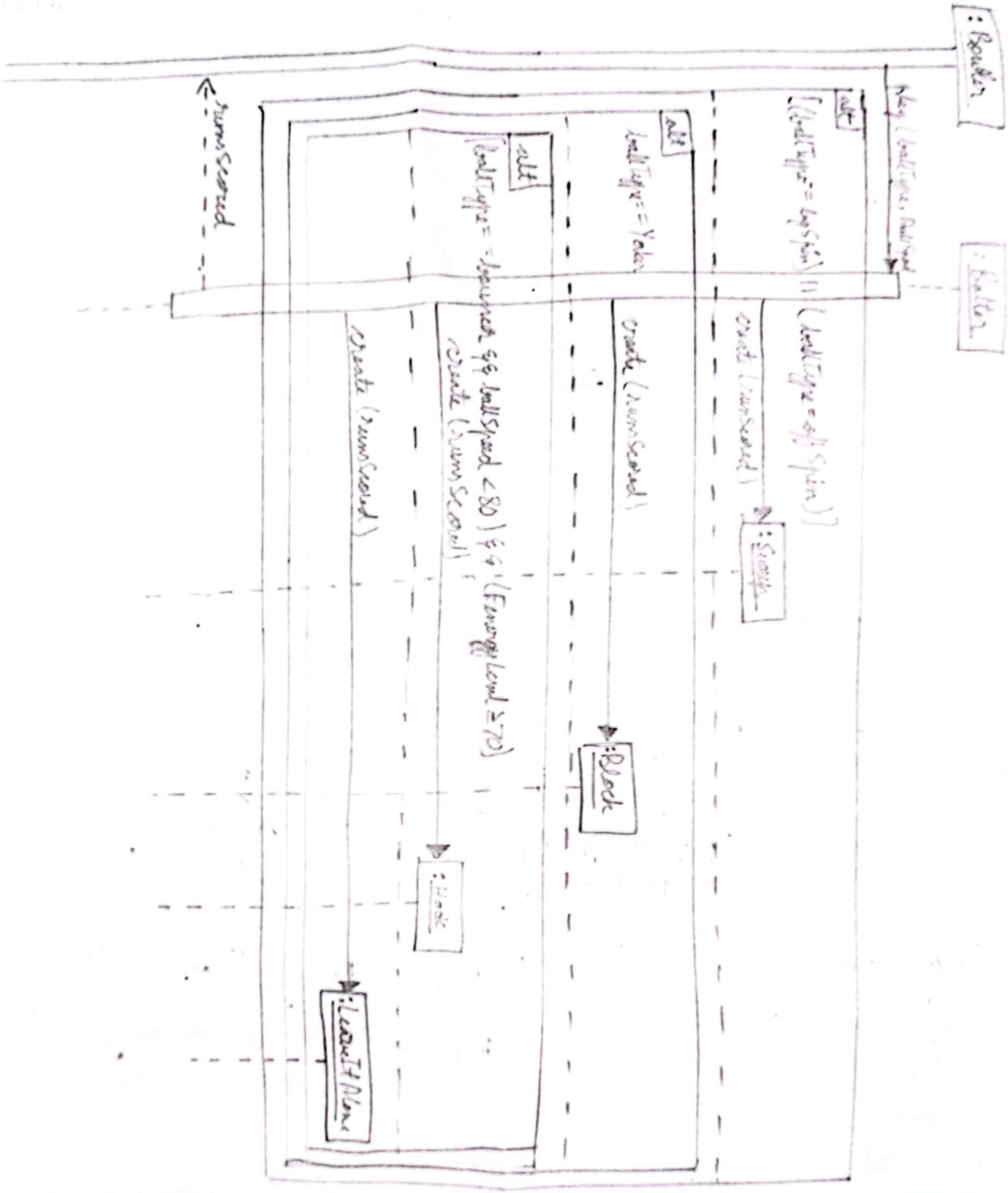


2+3 2.5+2.5

0011

Name: _____ Roll Number: _____ Section ____

[Use the space below on this page for answering Question 1b (UML 2 **design sequence diagram**) only.]



6 (Objects)
3 (Conditions)
1 (PlayBall, Runs)

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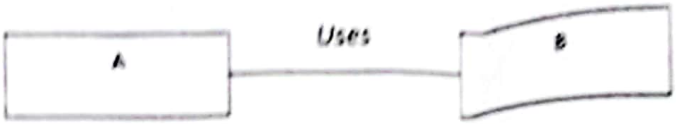
Name _____ Roll Number _____ Section _____

Question 2 (Max. Marks = 5 + 5 + 5 = 15) (CLO 2)

The following parts show partial designs (using UML 2 design class diagrams) of software applications. You are required to refactor/improve these designs using SOLID principles. Exactly one SOLID principle should be used in each part. Important instructions given in some parts must be followed to select the correct SOLID principle.

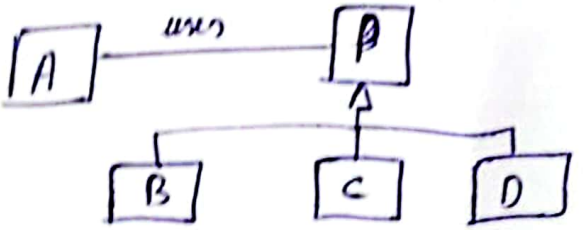
a)

Before



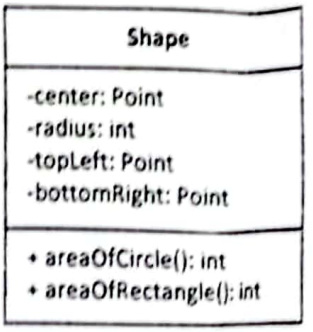
Important Instructions: In the future, Class B may be replaced by Class C or Class D.

After SOLID Principle Used: Dependency Inversion Principle

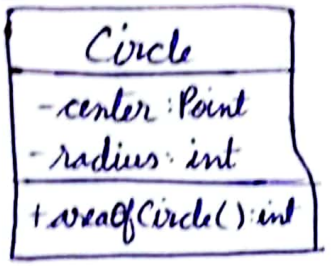


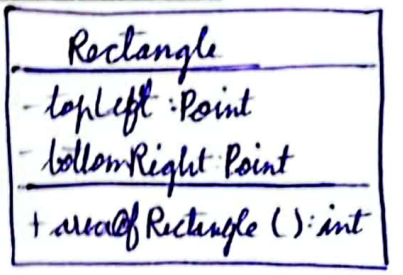
b)

Before



After SOLID Principle Used: SRP

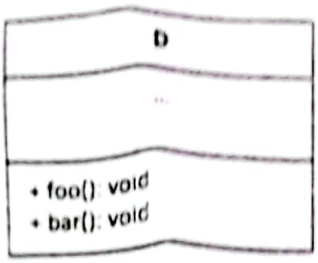




Name: _____ Roll Number: _____ Section: _____

c)

Before



Important Instructions: One client class of D uses only foo() while the other uses only bar()

After SOLID Principle Used: ISP