CIS 400: Object-Oriented Design, Development, and Testing

Fall 2023

Exam 2 – 100 points

**This test is closed-notes and closed-computers.**

There are 10 questions.

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Score: \_\_\_\_\_\_\_\_\_\_\_\_

1. (3 pts) What is the purpose of data binding?
   1. To enforce bounds on properties
   2. To prevent data from being changed
   3. To require a data class to implement *INotifyPropertyChanged*
   4. To synchronize data between a regular C# object and the GUI
2. (3 pts) What does the ViewModel do in MVVM?
   1. Manages the user interface layout and design
   2. Applies logic and formatting to the data to create properties that the user interface can bind to
   3. Tests the user interface by modeling different user interactions
   4. Stores all the data
3. (3 pts) Suppose our *MainWindow*’s XAML adds a control named *ExamControl*. Further suppose that in the constructor of *MainWindow*, that we do: “***DataContext = list;***”, where *list* has type *List<string>*. If we never set the *DataContext* of *ExamControl*, what value does its *DataContext* have?
   1. *ExamControl*’s *DataContext* is also *list*
   2. *ExamControl*’s *DataContext* is null
   3. *ExamControl*’s *DataContext* is the *MainWindow*
   4. We will have a compilation error because *List<string>* is not a valid *DataContext*
4. (3 pts) Consider the *ButtonNameEventArgs* and *SampleControl* classes in the handout at the end of the exam. Within *SampleControl*, how would we declare an event named *ButtonEvent* that used *ButtonNameEventArgs* as our custom event args?
   1. ***public ButtonEvent<ButtonNameEventArgs>;***
   2. ***public event<ButtonNameEventArgs> ButtonEvent;***
   3. ***public event EventHandler<ButtonNameEventArgs> ButtonEvent;***
   4. ***public EventHandler ButtonEvent<ButtonNameEventArgs>;***
5. (3 pts) Assume *ButtonEvent* from #4 has been defined in *SampleControl*. Suppose the *ButtonClick* method is the Click event handler for several buttons defined in the *SampleControl*’s XAML, and that the *Name* property for each button has been set. As if we were inside the *ButtonClick* method, how would we invoke *ButtonEvent* to include the clicked button’s name? (You may want to refer to the handout.)
   1. ***ButtonEvent?.Invoke(this, new ButtonNameEventArgs(sender.Name));***
   2. ***new ButtonEvent?.Invoke(new ButtonEventArgs(sender));***
   3. ***ButtonEvent?.Invoke(this, new ButtonNameEventArgs((sender as Button).Name));***
   4. ***new ButtonEventArgs?.Invoke(ButtonEvent);***
6. (3 pts) Following the work in #4-5 and referring to the handout, suppose that *MainWindow* adds a *SampleControl* named *MySample* in its XAML. If we wanted *MainWindow* to be able to do something whenever *ButtonEvent* was invoked, what would need to do?
   1. Create an event handler in *MainWindow* and attach that event handler to *MySample.ButtonEvent*
   2. Make *SampleControl* implement *INotifyPropertyChanged*
   3. We can’t access *MainWindow* from *SampleControl* without adding it as a field
   4. Create an event handler in *MainWindow* and attach that event handler to *SampleControl.ButtonEvent*
7. (22 pts) Draw the *DrawXAML* control defined in the handout as it will appear on screen:

1. (30 pts) Write the class *Rectangle* as shown in the UML from the handout. Be sure that its *Area* and *Perimeter* properties correctly give the area and perimeter of a rectangle, that the result of *ToString()* has the format “3x4 rectangle, area 12, perimeter 14”, and that the class correctly implements the *INotifyPropertyChanged* interface.
2. (15 pts) Complete the XAML below to display the *Length*, *Width*, *Area*, and *Perimeter* properties from the *Rectangle* class (use whatever controls you want as long as they display the appropriate values). Assume the *DataContext* for the control is a *Rectangle*.

**<StackPanel>**

**</StackPanel>**

1. (15 pts) Complete both the inline data and the implementation for the following unit test of the *Rectangle* class:

**[Theory]**

**public void ChangingWidthShouldNotifyOfPropertyChange(int width,**

**string propertyName)**

**{**

**}**

**HANDOUT - Feel free to remove this portion to make it easier to work.**

**//This page is needed for the multiple choice problems**

public class ButtonNameEventArgs : RoutedEventArgs

{

public string ButtonName { get; init; }

public ButtonNameEventArgs(string n)

{

ButtonName = n;

}

}

public class SampleControl : UserControl

{

//the constructor is hidden (and not relevant)

private void ButtonClick(object? sender, RoutedEventArgs e)

{

}

}

**//This page is needed for #7**

﻿<UserControl x:Class="Exam2.DrawXAML" ...

d:DesignHeight="450" d:DesignWidth="800">

<Grid>

<Grid.ColumnDefinitions>

<ColumnDefinition Width="1\*"/>

<ColumnDefinition Width="3\*"/>

<ColumnDefinition Width="1\*"/>

</Grid.ColumnDefinitions>

<Grid.RowDefinitions>

<RowDefinition Height="1\*"/>

</Grid.RowDefinitions>

<DockPanel Grid.Row="0" Grid.Column="0">

<TextBlock Text="Hello" DockPanel.Dock="Top"/>

<Button DockPanel.Dock="Bottom">Click me</Button

</DockPanel>

<Grid Grid.Row="0" Grid.Column="1">

<Grid.RowDefinitions>

<RowDefinition Height="1\*"/>

<RowDefinition Height="1\*"/>

<RowDefinition Height="3\*"/>

</Grid.RowDefinitions>

<TextBlock Text="One" Grid.Row="0"/>

<TextBlock Text="Two" Grid.Row="1"/>

</Grid>

<StackPanel Grid.Row="0" Grid.Column="2">

<Button>Apple</Button>

<Button>Orange</Button>

</StackPanel>

</Grid>

</UserControl>

**//This page is needed for #8-10**

