Theory ISW

Theory Evaluation

Jan 19th 2023

3h 30 min

Norms:

- **Do not open the exam** until it is indicated by a lecturer in the classroom.
- Write your answers using the attached pages (no extra sheets will be given). You may only extract the exam text page.
- Submission:
  - The student will identify him(her)self when delivering the exam answers.
  - The exam text and answers will be introduced in a box available.
  - The submission will be carried out in an orderly way. One student only will be delivering the exam at a time.

Software Engineering

Computer Science School

DSIC – UPV

Year 2022-2023

Software Engineering (ISW)

Theory Evaluation
Jan 19th 2023
ETSInf-UPV

NAME:
GROUP:

Time: 3 hours 30 minutes

Questions *(2 points)*

1. (0.5 *points*) You belong to a software development team that must start a new development project. What aspects should you consider to decide the development methodology to be used? Discuss at least two aspects.

2. (*0.5 points*) Is *Entity Framework* a concrete example of the Data Access Object (DAO) pattern? Justify your answer.

3. (*1 point*) An unexperienced programmer has implemented a functionality to show in a combo box the Ids of customers who are sanctioned. To do so, he/she has implemented the following code (assume the code compiles and runs correctly). What design problem does this solution have and what are its disadvantages? How should it be done? It is not necessary to rewrite the code but just describe how a good alternative solution should be.

```
public void LoadData(){

SqlConnection conn = new SqlConnection("Data Source=computer_name;" +
"Initial Catalog=simplesql;" + "User ID=sa;" + "Password=pass;");
SqlDataReader dr;

SqlCommand cmd = new SqlCommand();
cmd.CommandTimeout = 60;
cmd.Connection = conn;
cmd.CommandType = CommandType.Text;
cmd.CommandText = "SELECT Dni FROM Customers WHERE fined=1";

conn.Open();

customersComboBox.Items.Clear();
if (conn.State == ConnectionState.Open) {
      dr = cmd.ExecuteReader();
      while (dr.Read())
       customersComboBox.Items.Add(dr[0]);
}
customersComboBox.SelectedIndex = -1;
customersComboBox.ResetText();
dr.Close();

conn.Close();
}
```

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Problems *(8 points)*

4. *(4.5 points)* Given the following description obtain

   a) (2.5 points) the associated UML class diagram (**do not include methods nor attribute types).**

   b) (2 points) the structured UML use cases diagram.

ISWSoft has been hired by the Princeton-Plainsboro Hospital to develop MyApp, a software for managing rare diseases affecting children at early ages. To this end, different teams consisting of physicians from different medical specialties will oversee the evolution of patients using the new software. For each physician the system will store the name, the medical specialty and whether the physician is a director of a medical team. A physician may belong to many medical teams and be director of many medical teams. MyApp will allow physicians to create a nutritional goal for each patient. A nutritional goal defines the percentages of proteins, fat and carbs that a patient may eat daily. MyApp will use the weight, height and age of each patient and the nutritional goal to calculate the daily menu for each patient. The menus for each patient are automatically calculated for a complete week at the beginning of each week. For each patient the system will also store the name and each patient will have a responsible person (usually a parent) who will use MyApp. The system will also store the name for all responsible persons.

Each generated personalized menu will contain the date when it is supposed to be eaten. The menu may be a breakfast, a lunch or a dinner and it will have associated a recipe. Each recipe will contain the number of people it is designed for, a text with the preparation instructions and a list of ingredients and the quantity of each ingredient. For each ingredient the system will store the name and the nutritional composition (amount of proteins, fat and carbos per 100 gr.). Once the menus have been generated, the responsible person of a patient may consult them and also report the percentage of the menu that was actually eaten by the patient. If a patient does not like a menu, it may be modified by a physician by changing the associated recipe. To update a menu a physician may either change the recipe by another existing one or create a new recipe using MyApp using the available ingredients. Responsible persons of patients will also use MyApp to report the daily symptoms of patients indicating the type of symptom, the intensity, and the date.

Physicians will have a username and a password to access the system. In the first patient visit any physician of the medical team may register the new patient and provide a username and a password to the responsible person of the patient to use MyApp. Any physician may consult the list of patients already registered in the system and if the patient does not exist, the physician may register it. If the patient exists, the physician may consult the patient record that shows the percentage of food eaten for each menu and the symptoms reported by the patients' responsible persons. From a patient record a physician will be able to define a nutritional goal for a patient.

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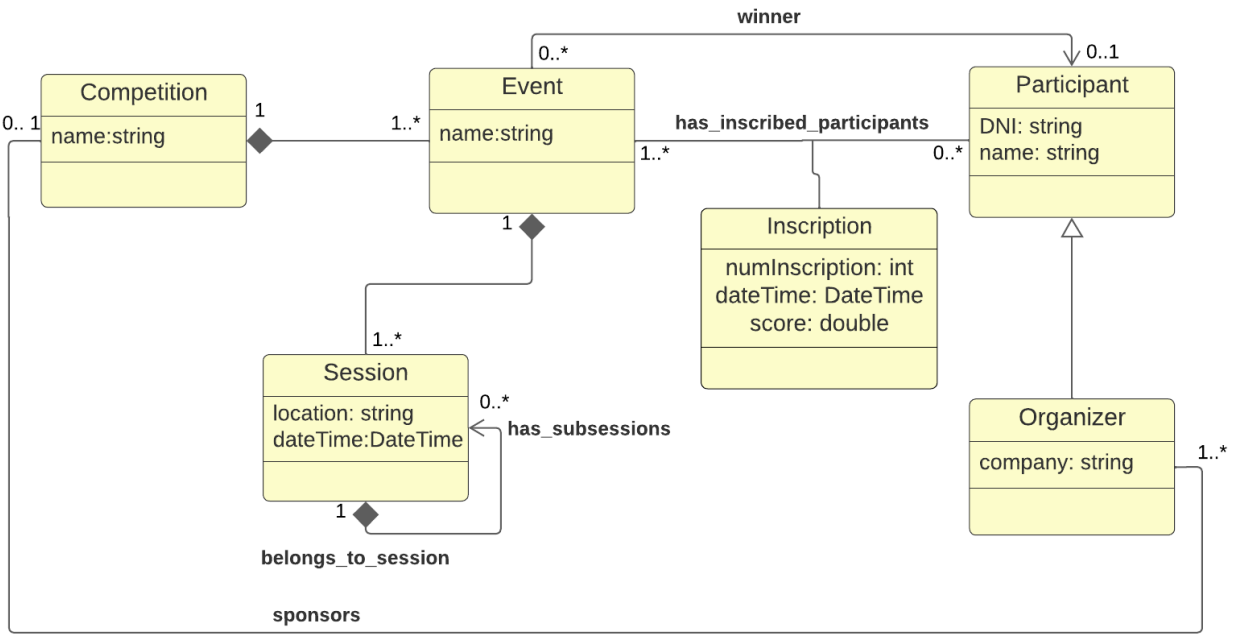
5. *(2 points)* Given the following UML class diagram:



Note: There is a navigation restriction between Event and Participant and between Session and Session.

a) *(1 point)* Obtain the C# design following the design patterns studied (do not add any class methods).

b) *(0.5 points)* Obtain the C# design of the constructor with parameters for each class (just the header, do not implement them. Do not define the constructor without parameters).

c) *(0.5 points)* Using the constructors from the previous question implement the necessary code to create a system consistent with the diagram for the following requirement: The "VLC Testing" competition is registered with just one event "Hakckaton JUnit" and two inscribed participants. One of them is both organizer and sponsor of the competition. Use any other arbitrary values for the remaining attributes.

6. (*1.5 points*) Obtain the test cases for the following code using the basis path testing technique. Obtain the flow graph, calculate the cyclomatic complexity, the independent paths and the associated test cases.

The Child class has three public "int" properties: HomeBehaviour, AcademicGrades and Gifts. HomeBehaviour and AcademicGrades may have values between 0 and 10. SantaCalculator is a function that returns the number of homes that Santa Claus must visit and modifies the list children, updating the property Gifts of its Child objects. **Assume that only the indicated code line may produce an exception and that children will NOT have any null elements.**

```
public static int SantaCalculator(List<Child> children)
{
  int numHomes = 0;
  try
  {
   int count = children.Count();        /*May produce
ArgumentNullException if children not initialized*/

for (int i=0;i<count; i++){
 if (children[i].HomeBehaviour < 2 || children[i].AcademicGrades < 3)
         children[i].Gifts = 0;
     else
         children[i].Gifts = (children[i].AcademicGrades +
                             children[i].HomeBehaviour) / 4;
     numHomes++;
   }
   return numHomes;
  }
  catch (ArgumentNullException)
  {
     return numHomes;
  }
}
```

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