M1 : Advanced UML

EFREI – M1 SIA – SESSION 2

Written Exam

(2 hours, all documents allowed)

(Barème indicatif sur 20)

1. Questions de cours [5 Pts]

Reply with precision and concision, and **justify** your answers.

Q1.1 : Describe the main steps of the V cycle **(1.5 points)**

Q1.2 : We wish to implement a package offering support for multi-criterion queries. For instance "title=*UML* AND date > 2005". Which design pattern(s) would you suggest to use? Explain your answer with a small class diagram. **(1.5 points)**

Q1.3 : We have developed system without security. We wish to add a security layer to the application. The facade pattern has allowed to centralize the system API around a single class System. Suggest a design pattern and how to apply it introduce security. **(2 points)**

2. Problem: Analysis of MenPower [15 Pts]

A company offering temporary jobs (interim) has decided to build an application to allow to satisfy client needs through a web site.

A contract description is set up online by a client and comprises of a set of interventions.

An intervention is described by possible intervention dates and a description of the work to be done. The description of work includes an evaluation in man/days of each skill necessary to complete the work. For instance "renovate bathroom", 2 man/days plumber, 2 man/days mason, 7/10/09-7/17/09.

The description of work can comprise several independent interventions, negotiated within the same contract.

Once the description of work has been provided by the client, a first price evaluation can be computed and presented to the client. Each skill has a base daily rate that is used to compute this first evaluation.

If the client validates this first evaluation, the information is passed to the human resources department (HRD). An HRD employee then finds appropriate personnel to satisfy the client needs. The company manages a list of personnel, and their skills. Each employee can have one or more skills, with a skill level evaluated from 1 (basic) to 30 (expert). Each employee also has an availability calendar that defines the dates at which they are available. For each intervention, the procedure consists in choosing a candidate employee to fulfil the required skills. The software should assist in this procedure by presenting a list needs to fulfil and a list of appropriate personnel (having appropriate skills) for each need.

The employees are then contacted, and must confirm their availability before their assignment to the contract is validated. The whole validation procedure should not exceed one business day.

Once the personnel has confirmed availability to the HRD, and the all intervention needs are satisfied, the client is informed of the effective intervention dates and a more precise contractual price evaluation is provided to the client through the web site. The effective price depends on the number of employees recruited, their respective skill levels, the dates of the intervention (Sundays count extra), and an overall price adjustment (not exceeding 10%) decided by the HRD employee. It may happen that no personnel is available at the provided dates, or that the client request is not satisfiable. The price provided for a contract only includes the interventions that are satisfiable.

The client should then validate his contract within 2 business day for the contract to be confirmed.

The next stage (effective contract followup) is not a part of this project.

Question 2.1 : Produce a use case diagram for this system. Annotate the diagram with comments, or explain by a short text what each identified use case and actor denotes. **(4 points)**

Question 2.2 : Build an analysis class diagram (only inheritance, simple associations with cardianlity, and no operations) for this system. Be as precise as possible. **(5 points)**

Question 2.3 : When going to design, we define four main components in the system.

The WebServer processes client requests and presents data to the client through web pages.

The HRDGui is the main graphical front-end application running on the HRD employee stations.

The PendingContractManager is responsible for managing the client contracts up to the point they are confirmed and pass to effective followup. It plays the role of controller in the system.

The PersonnelPool component manages the DB of personnel, their availability and their skills. It should provide a high level interface adapted to the application needs. It will be built as an adapter on top of the existing Personnel database.

Build a sequence diagram describing the interactions necessary to allow the HRD employee to select personnel that could be assigned to an intervention. Suppose the employee has just started his GUI front end.

Only represent lifelines of components, the actors need not be represented.

Question 2.4 : Deduce from the previous question the offered and required component interfaces (for this interaction), and represent them on a diagram (specify operation signatures as precisely as possible). **(3 points)**