

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

Time Allowed: 2 hours

Start Time: 9:15, End Time: 11:00

## BACKGROUND

Questions #1 to Question #3 are based on the following assumption; Assume that you are hired to design and develop a *benefit management* module in a human resource management project. This module is supposed to handle the following functionalities.

- HR administrator registers monthly benefit entitlements by specifying the description for benefit (fuel and representation, dessert, housing, mobile, and transport allowances), the positions allowed to receive the benefit, and the amount of money. Each position will also have a position name and requirement.
- The administrator can also register medical benefit for an employee by selecting an employee and specifying the medical assistance type (surgery, medication, diagnosis), the healthcare provider, and the refund amount.
- The HR manager can also process loans given to an employee. An employee needs to bring two other employees as guarantees to receive a loan. The loan amount, and date of loan will be registered along with the guarantees.
- HR processes annual bonus payments for employees. The HR administrator will register which employee received what bonus amount for every year.

1. The development team decided to use MVC system architecture.
  - a. [5 points] Assume that our system includes two web servers. Both web servers are identical: The first acts as a main server, while the second acts as a redundant backup in case the first one fails. Users use Web browsers to access data through the Web server. They also have the option of using a mobile application that accesses the web servers. Draw a UML deployment diagram representing the hardware/software mapping of our system.
  - b. [5 points] In many architectures, such as the MVC, the storage of persistent objects is handled by a dedicated layer. In your opinion, which design goals have lead to this decision? Why did you say so?
2. [10 points] Design a class diagram for the system. Your class diagram should show:
  - classes and relationships.
  - attribute and methods of classes. Methods with parameters and return types
  - multiplicity, association name, and roles.
3. [10 points] Draw a sequence diagram for the “process bonus” use case. The sequence diagram must follow an MVC architecture (with entity, boundary and controller classes). The sequence of steps in the main flow of events is given bellow:
  - i. The HR administrator clicks on “Process Bonus” link.
  - ii. The system shows a list of years such as (2013, 2014, 2015, 2016,...).
  - iii. The applicant selects one year from a list.
  - iv. The system shows a grid showing employees. Each row will contain an employee

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- name, the bonus amount to be given for the employee, and a save buttons.
- v. Administrator specifies the bonus amount for an employee and clicks the corresponding save button in the grid.
  - vi. The system verifies the bonus amount, and updates the employee's annual bonus, sends a confirmation message and goes back to step iv.
4. [10 points] Pick one method of an Entity class you used in the sequence diagram that you drew for Question #3. What was the purpose of this method? Write a PHP implementation of the method.