DUNMAN HIGH SCHOOL (SENIOR HIGH)

YEAR 6 PRELIMINARY EXAMINATION 2012

H2 Computing

Paper 2

9754/02

Tuesday 18 September 2012

1400-1630

2 hours and 30 minutes

Additional materials:
Answer Paper

INSTRUCTIONS TO CANDIDATES

Write your Center number, index number and name on all the work you hand in..

Write in dark blue or black pen on both sides of the paper.

You may use a soft pencil for any diagrams, graphs, tables or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer all questions. Total marks is 100.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets[] at the end of each question or part question.

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This question paper consists of printed pages and **1** blank page.

[Turn over

The Central Provident Fund (CPF) is a social security savings plan that aims to provide working Singaporeans with a sense of financial security and confidence in their old age. Members make monthly contribution to their CPF accounts from their salaries and may begin to withdraw from their contributions near retirement age.

1. CPF board notifies members who have reached the age of 55 to apply for withdrawal. These notifications are being generated, mailed to the members and the completed notifications returned by post. Information on the returns are then entered into a computer system.

   a. Name and justify a suitable data processing system in generating the notifications.
   [2]

   b. Name and justify a suitable file organization for the members master file for (a). [2]

   c. Name and justify a suitable file organization for the returns information. [2]

   d. Members may perform online enquiry of their CPF account details. Name and justify the type of file organization for this purpose. [2]

   e. Suggest how you would convert the file in (c) to (d). [5]

2. Assume that CPF Board applies the following rules on the withdrawal of CPF savings:

   - If the member has not reached the age of 55 years old, withdrawal is not allowed.
   - If the member has less than the minimum sum required to remain in its account, withdrawal is not allowed.
   - If the member had used its CPF savings for housing loan and had paid off the loan completely, it may withdraw an additional half of the minimum sum. Otherwise withdrawal is not allowed.

   a. Create a decision table showing all the possible outcomes and results. [4]

   b. Simplify the decision table by removing redundancies. [3]

   c. Describe the usefulness of decision tables in the software development life cycle.
   [2]

3. The CPF Board main building has four counters for enquiries and four counters for withdrawals. The system will manage the servicing of the CPF members based on the queue numbers obtained when they indicate the service required at the entrance. The system can accommodate up to 100 members of both types. Monitor screens display the queue numbers and the counter numbers when they are being called. Each counter serves one member at any one time. Assume all counters are manned at all times.
   As soon as a staff at a counter has finished serving a member, the system will pick the next queue number and flash the number with the available counter number on the monitor screens. When the member responds to the call up, the flashing of the queue

number stops to indicate that current queue number is being served. If the member does not respond to the call up within 30 flashes, its queue number will be forfeited and the next queue number picked.

The four counters for enquiries is stored in an array **E** and the four counters for withdrawals is stored in an array **W**.
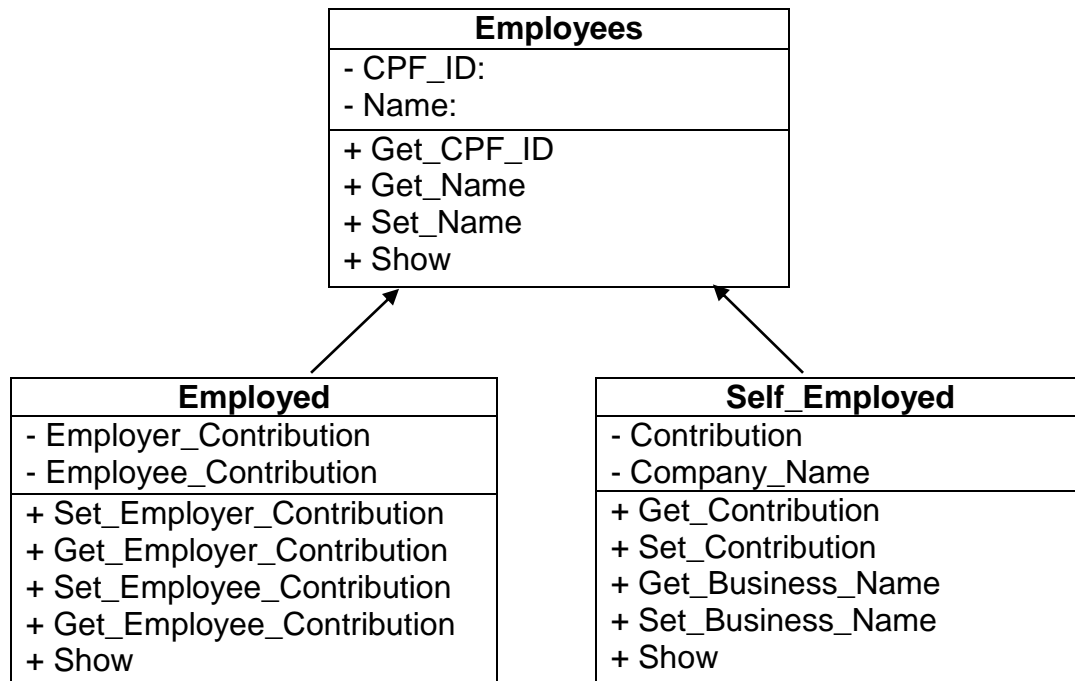
The CPF members' queue numbers are stored in arrays **QE** and **QW** which are for enquiries and withdrawal respectively

a. Draw a program flowchart to illustrate how members queue numbers and the available counter numbers are updated on the screen display.   [4]

b. Using pseudocode, write algorithms for the following:

(i) Insert a new queue number to the list of queue numbers waiting to be served.[4]

(ii) Remove a queue number from the list of queue numbers waiting to be served.
                                                                                [4]

c. There is a change where members who are more than 60 years old will have higher priority in the servicing of their withdrawals. How would the algorithm be modified to accommodate this change?   [4]

4. Employers are required by law to submit CPF contribution details of their employees to the CPF Board every month. If CPF contributions are not received after 14 days of the deadline, action will be taken as follows. The list of the employers whose contributions for the previous month not received will be generated from the employers file. This list is used to generate reminder letters to them. If the employers did not respond to these letters and did not submit their contributions, their names and particulars would be stored into a legal action file. CPF Board will then issue a legal letter against these employers. Sometimes, the employers will pay up after the legal letters are sent and no action will be taken. If the contributions are submitted late by three months, interest will be imposed on these late contributions.

(a) Draw a dataflow diagram for the above process.   [6]

(b) How can the dataflow diagram help a system analyst derive useful information for a database solution?   [3]

An auditor has been engaged to audit the monthly CPF statements of randomly selected companies towards their part-time employees' CPF. Each company may employ zero or more part-time employees, and each part-time employee may be employed by more than one company.

(c) Draw E-R diagrams to show the relationships between a company, its part-time employees, and its part-time employees' monthly CPF statements. Your diagrams should contain both the before and after resolution of any many-to-many relationships.   [3]

5. There are two types of CPF members who contributes to their own CPF accounts. For employed members, both the employee and its employer make contributions to the member's account. For self-employed members, they will make contribution to their own CPF account together with their company name to the CPF Board for verification purpose. The following diagram shows the classes involved and their relationship.

Employees
- CPF_ID:
- Name:
+ Get_CPF_ID
+ Get_Name
+ Set_Name
+ Show

Employed
- Employer_Contribution
- Employee_Contribution
+ Set_Employer_Contribution
+ Get_Employer_Contribution
+ Set_Employee_Contribution
+ Get_Employee_Contribution
+ Show

Self_Employed
- Contribution
- Company_Name
+ Get_Contribution
+ Set_Contribution
+ Get_Business_Name
+ Set_Business_Name
+ Show

   a. Using this example , explain the terms
       (i)   Class and object
       (ii)   Encapsulation
       (iii) Inheritance
       (iv)   Polymorphism

                                                                                    [8]

   b. Explain how inheritance promotes software reuse.   [2]

   c. Explain how polymorphism promotes code generalization.   [2]

   d. Using examples , describe the relationship between the table fields in a database design and the data in the class diagram.   [3]

6. To gain access to the online enquiry system, the member enters a userid and password to login to its CPF account.

   a. Describe problems that could arise for the member and the CPF Board computer centre using this method of access.   [2]

   b. Describe methods that could be used to overcome the problems.   [4]

The CPF board decides that an additional level of security is required for online enquiries. Members who wish to perform online enquires will first have to register and associate their mobile phone numbers with their accounts. To login, a member will

- Input its userid and password
- A generated PIN will be sent to the member's registered mobile phone number via SMS. This PIN has to be entered into the computer within a grace period of one minute for the login to be successful.

c. Explain how this new system improves security. [2]

The userid is the National Registration Identity Card number which is defined as
- First letter must be S, T, F or G followed by
- 7 digits and
- A check letter consisting of one of the alphabets: A B C D E F G H I Z J

d. Draw syntax diagrams to define the userid. [6]

7. The CPF Board will open a new branch office in a new town. A local area network is to be set up and linked to the CPF Board's existing wide area network (WAN).

a. State two differences between a LAN and a WAN [2]

The network administrator is evaluating the use of either a bus or star topology for the new LAN. There are up to 30 networked computers and shared network resources to be connected.

b. Produce an evaluation matrix to compare the following network topologies and recommend the most appropriate topology for the new LAN. Include a schematic drawing of each topology.
   (i) Bus
   (ii) Star

[7]

c. Explain the purpose of the following items of network hardware. For each item give an example of how it could be used in the network.
   (i) Network Interface Card
   (ii) Bridge
   (iii) Server

[6]

d. Explain why standard protocols are needed in wide area networks. [2]

e. Describe **two** methods that can be used to help improve the efficiency and reliability of data communication. [4]

END OF PAPER

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