Name:		Index Number:		Class:	

DUNMAN HIGH SCHOOL
Preliminary Examination
Year 6

COMPUTING

9754

Paper Number 2

26 September 2011

Time: 0830 – 1100

Duration: 2.5 hours

Additional Materials:
Answer papers

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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Over the years, a home-grown technology company has expanded its business overseas to become a MNC (Multi-National Company). The recent resignation of its CEO (Chief Executive Officer) has necessitated the company to elect a new manager to oversee its business operations. Due to its increased membership base spanning across different offices across countries, it is felt that a manual election process involving filling in of paper voting slips and manual vote counting will be inefficient. The IT department is contemplating to automate polling.

In the manual polling process, each member is issued with a voting slip similar to the following:

Lim Ah Seng	☂	
Tan Ah Lian	⌘	
Teo Ah Meng	☢	
Yeo Ah Beng	✿	

A valid vote is marked by an 'X' in the appropriate candidate's column. After all voters have voted, the organizing committee in each office will reveal and count all votes in front of all members present. The vote counts are then tallied across the company's offices to determine its CEO.

1(a) State **two** problems of the manual polling process. [2]

(b) Give **two** benefits of computerizing the polling process. [2]

(c) Discuss **two** challenges of computerizing the polling process. [2]

(d) Draw a data flow diagram to illustrate the manual polling process. [4]

2. Propose two ways in which effective and low cost technology can help to automate the manual polling process. [6]

To facilitate communication and collaboration, the company's offices in the different countries need to be connected using a wide area network (WAN). Within each country, an office occupies a single storey in a building with workstations and servers connected using a local area network (LAN). The company currently houses about 100 employees across 3 countries. Apart from daily routines such as email and instant messaging, the company's also utilizes computationally intensive applications such as video conferencing and multimedia production.

3 (a) Distinguish between WAN and LAN. [2]

(b) Suggest and justify a suitable network topology for the local office network. [3]

(c) Using examples, explain the need for standard protocols in a LAN and WAN. [3]

The newly elected CEO intends to organize a telematch to help improve bonding of its employees. The telematch will take place between 16 teams during its annual retreat in Singapore.

There are 2 proposed formats for the telematch:

- a round-robin format in which a team will play against all other teams, and the final winner being the team with the highest score. A win will score 3 points and a draw 1 point.
- a knock-out format in which 2 randomly selected teams will pit against each other, and the winner of each round will then compete to decide who the eventual winner is.

4. For the round-robin format,

(a) What information needs to be stored about each team and how can this be represented? [3]

(b) How many games will be played in the entire telematch? [2]

(c) Devise, with justification, algorithms to

(i) compute the final scores of all teams [5]

(ii) determine the top 3 winning teams. [5]

(d) Using a suitable diagrammatic notation, produce a top-down modular design of the system. [3]

(e) Errors usually occur during the development process. In the context of the telematch system, describe what is meant by the following types of errors and why they occur:

(i) semantic

(ii) syntax

(iii) logic

(iv) arithmetic

[8]

5. For the knock-out format,

(a) Using a diagram, illustrate how the telematch can be played to determine the winner. [3]

(b) What is the number of matches a team has to win to emerge as the overall winner? [2]

(c) Based on your answer for (a), describe an algorithm which given a team name, will display its results in the telematch. [4]

(d) How can the information in (a) be represented using

(i) a direct access data structure

(ii) a sequential access data structure

[2]

(e) Discuss the factors which will contribute to your decision to (d). [2]

The company has two main categories of employees: those drawing a fixed monthly salary and those drawing a basic pay plus commission. In addition to these permanent staff, it also engages temporary freelancers on a project basis, who are paid an hourly rate times the total number of hours worked. The company issues payroll statements to all employees at the end of each month.

6 (a) Produce a suitable class diagram to show the relationship between the different types of employees. [5]

(b) Using suitable examples, illustrate the concepts of

(i) encapsulation

(ii) inheritance

(iii) polymorphism

[6]

(c) Why is the object-oriented programming paradigm well suited to the payroll application? [3]

(d) Explain **one** limitation of the object-oriented programming paradigm. [2]

The salary of an employee is determined as follows:

- If a permanent employee is in the operations department, he or she is paid a fixed monthly salary.
- If a permanent employee is in the marketing department, he or she is paid a fixed monthly salary with commission, depending on the sales target achieved in that month.
- A temporary employee is paid a fixed hourly rate times the number of hours worked.
- If a temporary employee works more than 40 hours a week, he or she will also earn an overtime pay of 1.5 times the normal hourly rate.

7. For the determination of an employee's salary:

(a) Produce a decision table listing all possible conditions and actions. [4]

(b) Optimize the decision table by reducing redundancies. [3]

(c) Translate this decision table into pseudocode. [3]

There is a need to store information about the employees and their pay persistently. The systems analyst would need to decide to manage this information using either a flat file or a relational database.

8 (a) Propose a suitable flat file organization to store the employee and pay information. [3]

(b) Propose a suitable database design to store the employee and pay information. Your design should include an E-R diagram as well as a table specification highlighting the primary keys and any foreign key(s). [6]

(c) How would the systems analyst make a rational decision to store the information effectively and efficiently? [2]