HWA CHONG INSTITUTION
C2 PRELIMINARY EXAMINATION 2013

COMPUTING
Higher 2

24 September 2013   Paper 2 (9597 / 02)   0815 -- 1115 hrs

Answer *ALL* questions.
Begin *EACH QUESTION* on a *FRESH SHEET* of paper.

The maximum mark for this paper is 100.

1.   A newly opened clinic has engaged a programmer to design a new online system to store patient data and medical history. Some of the information required includes:

- Patient salutation
- Patient name and address
- Patient gender
- Patient home telephone
- Patient mobile
- Next of kin [Name]
- A brief write up on the patient's medical history

(a)   For this application design a screen layout which makes use of appropriate graphical user interface controls.   [3]

(b)   Provide a brief explanation on the key elements in screen layout and why do you use them?   [2]

(c)   In recent we have seen a wide spread of a new generation of interfaces in many devices. Namely, Gesture Interface and Natural language interface.

- Briefly describe both interfaces.   [4]

- What are the strength of these interfaces as compared to the more traditional kind of interfaces such as command line and graphical user inteface.   [3]

2.

Patient Appointment Record				
Name: _____				
Address: _____				
Home Telephone: _____				
Mobile: _____				
Next of kin: _____				
Appointments				
Date	Time	Doctor ID	Doctor Name	Descriptions

Note:
- Each patient may have many appointments with the clinic
- Each form may have multiple lines of appointments
- One line contains the details for a single appointment
- An appointment can appear only on one line on a form
- A doctor may appear on many different forms

The clinic using this appointment form is computerizing the system to store data into a relational database.

(a) Identify the tables that will give a normalized solution to this problem. Your solution should provide
    (i) the purpose of each table
    (ii) shorthand notation for each table indicating their key field/s and attributes

Your solution must take into consideration that a patient may have multiple appointments with the clinic. [9]

(b) Draw the ER diagram between the relations. Include a brief description of the relationships. [4]

(c) Based on your understanding of relational database, explain how data inconsistency could arise and explain why data could be redundant. [2]

3. (a) What are the characteristics of client-server network architecture? [2]

(b) Give 2 examples of a server and explain how they function in a network. [4]

(c) Describe how parity bits are used to check the accuracy of a block of bits. Give an example to support your answers. [4]

(d) Explain the following cloud computing concepts:

    (i)   Software as a service [1]
    (ii)   Platform as a service [1]
    (iii)   Infrastructure as a service [1]

4. The environment in a particular exhibition hall is computer controlled. The computer system has the required temperature (T) input. The system is programmed to maintain the temperature in the hall to within 2 degrees of T.

(a) State suitable input and output hardware that will allow a computer to control such a system. Give reasons for your answers. [2]

(b) Explain why the system is set up in this way and not to keep the temperature equal to T. [2]

(c) Using pseudocode, write an algorithm to control the temperature in the hall, given that the actual temperature is A, and that the processor can switch both a heater (H) and an air conditioner (C) to be ON or OFF. [8]

5. A software company has been engaged to develop a software application for a museum.

(a) Below is a PERT chart that the project manager used to help him plan and monitor the tasks involved.
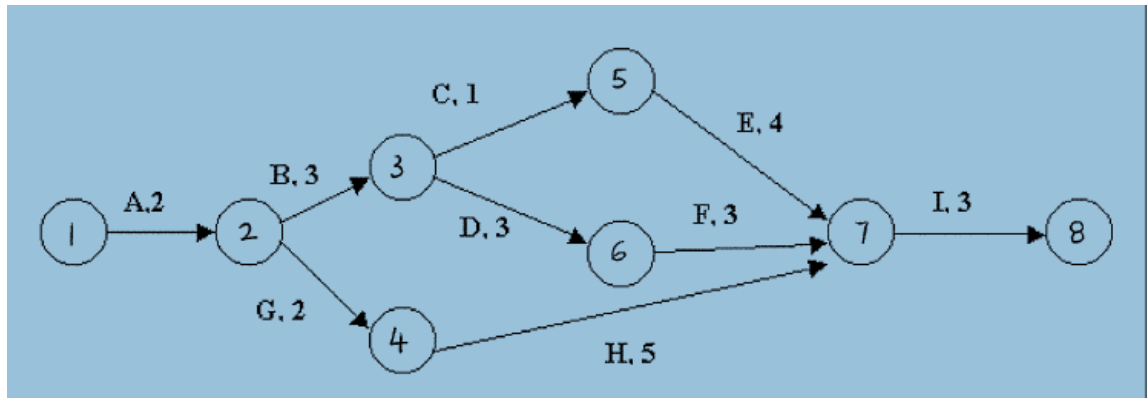
(i) Which tasks are on the critical path of the Program Evaluation and Review Technique (PERT) chart? [1]

(ii) What is the slack time for Task C and G? [1]

(iii) The person working on Task C tells the project manager he cannot start work until one day after the scheduled starting date. What impact would this have on the completion date of the project? Why? [2]

(iv) Task A will be delayed by 2 days for some reason. If the project manager still wants to finish the project within the original time frame, he will need to shorten the time for one or more of the tasks. What steps can he take to reduce the number of days allocated to a task? [2]

(v) The project manager decides to reduce the time needed for Tasks D and F by one day each. How effective will this reduction be in achieving his aim of maintaining the original finish time for the project? What can he do for it to be more effective? [3]

(b) The Museum hires Guides to station at different sections of the Museum. An applicant is hired if he/she satisfies any of the following criteria:

- above 1.7m tall and has at least an "A" level certificate
- has prior experience and is above 1.7m tall
- has at least an "A" level certificate and has prior experience

All other applicants are rejected **unless** he/she is above 1.7m tall. In this case, the applicant is accepted for a probation period.

(i) Create a decision table showing all possible outcomes and results.
(ii) Simplify your decision table by removing redundancies. [6]

The application required by the museum involves keeping track of

- Information and movement of the artefacts. Artefacts may be borrowed from other museums or loaned to other museums. This is handled by the Artefacts Department.

- Ticket sales and profile of its visitors. This is handled by the Marketing Department. This information is also useful to plan the type of artefacts to acquire and display.

Thus, both the Artefacts and Marketing Department have to work closely with each other.

The Detailed System Design is one of the phases in the System Development Cycle. This phase includes the planning of the Test Strategy as well as the Implementation Strategy.

(c) The software is a collection of different modules interacting with each other. Describe how the system should be tested by the software company. [6]

(d) Explain each of the following three methods of implementation in relation to this example:
  (i)   Pilot changeover
  (ii)   Phased introduction
  (iii)   Direct changeover

[6]

  (iv)   State which of these methods would be most suitable, justifying your answer. [1]

6. (a) The insertion sort can be used to sort short lists. Write a detailed algorithm to implement Insertion Sort on an array of N unsorted integers. [4]

(b) Describe an algorithm for searching an array of numbers, which are in ascending order, for a given value. Your algorithm should be able to deal with the case of the value not being in the list. [4]

7. (a) In an object-oriented program, Point, Circle, Rectangle and Cylinder are four defined classes. The attributes and methods of Point are defined as shown below:

Point

Private:
    xCoordinate
    yCoordinate

Public:
    setCoordiantes()
    getCoordinates()

(a) Draw an inheritance diagram for the above classes. You are to include at least one attribute and one method of the classes Circle, Rectangle and Cylinder.   [4]

(b) Use your answers to (a) to explain the following terms.

  (i)   Inheritance
  (ii)   Polymorphism
  (iii)   Encapsulation   [6]

  in object-oriented programming.

(c) How is data hiding achieved in a class?   [2]

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