

**HWA CHONG INSTITUTION
C2 PRELIMINARY EXAMINATION 2015**

COMPUTING

Higher 2

17 September 2015

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) What do you understand by the usability of a user interface? [3]

- (b) Handheld mobile devices have become increasingly prevalent. Shneiderman's "Golden Rules of Interface Design" have existed for some time now. Making use of the "Golden Rules" as a starting point, grounded in previous research studies proposes a set of guidelines for mobile device interface design. Clear explanation needed to articulate your guidelines. Use examples if necessary to illustrate your point. [9]

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

- (b) Give 2 examples of servers 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]

3. Your company is starting the development of relational database for a patient billing system to be marketed to private medical practices in Singapore. The system is to be called PATMAN (short for PATient billing MANager), and is to run as a remote client-server system and a local area network.

An initial analysis phase of the project has resulted in the following description of the relevant data for PATMAN.

- A practice has a number of patients and doctors.
- Doctors are identified by name.
- Each patient has a number used to identify the patient called the OHIP number, a name and an age.
- Each patient is either a male or female and has a next of kin identified by name.
- Each medical procedure paid by the government of Singapore is identified by a procedure code and has a description and a charging category.
- Each charging category has a dollar value.
- Each patient has a number of billing records, with each billing record recording the medical procedure, the date on which the procedure was performed, the examining doctor and some additional comments on the part of the examining doctor.
- Billing records are either outstanding or paid in full.

- (a) Draw an ER diagram that represents the PATMAN data. [6]
- (b) Using shorthand notation, what are tables in this relational database? [12]
- (c) Explain why relational database is better than a flat file design? [2]

4. The University bookstore sells books online and charges for delivery. Its delivery charges for orders less than \$200 are as follows:

- If the number of items is 3 or less, delivery by next day will be charged at \$30, while standard delivery will be charged at \$2 per item.
- If the number of items is 4 or more, delivery by next day will be charged at \$5 per item, while standard delivery is free.

For orders more than \$200, standard delivery is free for any number of items, while delivery by next day will be charged at \$5 per item.

- (a) Draw a decision table showing all the possible conditions and actions.
- (b) Simplify your decision table by removing the redundancies.

[5]

5. HC university has various campuses around the city and Wilson Parking is responsible for all the university car parks.

At each car park:

A car arriving triggers a sensor (S1) and a fixed fee (F) is paid into a machine. This allows a barrier (B1) to be lifted and the car to enter the car park. When a car leaves the car park it passes over another sensor (S2) and another barrier (B2) is lifted.

Each car park has a maximum number of spaces for cars (M) and when this maximum is reached a “FULL” sign is illuminated at the entrance and the barrier (B1) will not rise. The car park is closed at least once a day for cleaning purposes.

- (a) Write an algorithm which will control the barriers and which will keep a total (T) of the fees paid.

[8]

There are 100 car parks, each of which is identified by a number between 1 and 100.

At the end of each month, the total fees paid for that month (T) is collected from each of the car parks as an integer value.

All data are stored in an array Parks().

- For car park x, Parks(x, 1) to Parks(x, 12) contains the totals for the twelve months of the year.
- Parks(x, 13) contain the annual total fees collected for each car park.

- (b) Using Parks(x,y) to identify individual values in the array, write an algorithm which can be used to produce the annual totals once the twelve monthly totals have been input to the array, and the grand annual total for all the 100 car parks.

[5]

- (c) When implementing the algorithm into program code, they should be written to display clarity. Describe **three** features of the final program code for this implementation that would achieve this goal.

[3]

6. A systems analyst is developing a new computerized admission system for HC University.

The project manager identifies the following activities with their durations and precedence relations:

Task	Predecessors	Time(Weeks)
A	-	3
B	-	5
C	-	7
D	A	8
E	B	5
F	C	5
G	E	4
H	F	5
I	D	6
J	G,H	4

- (a) (i) Draw a Program Evaluation and Review Technique (PERT) chart, show clearly the early start and late start time of each task, showing dummy tasks, where necessary. [4]
- (ii) Explain dependent stages and concurrent stages, giving examples from your chart. [2]
- (iii) State the critical path and the minimum time in which the project can be completed. [2]
- (b) Produce a Gantt chart based on the above information. [3]
- (c) Give **one** reason why a Gantt chart may be preferred over a PERT chart. [1]

In the current system,

- Each new student sends a completed form that has their name, date of birth and the courses that they wish to enroll on.
- The date of birth is checked to see whether the student is of the correct age range for admission to the college.
- If the student is too young or too old, a standard rejection letter is produced.
- If the student is of the correct age then each of the courses that the student has identified are checked on the course file to see whether they are full or not.
- If there is room on a course then the student name is added to the appropriate course record on the course file.
- A standard letter is produced with details of which course(s) the student has been enrolled on.

- (d) (i) Draw a data flow diagram (DFD) for the current system. [6]
- (ii) Using examples from your DFD, explain how the diagram helps to inform a database solution for the new computerized system. [4]
- (iii) Give **two** parts of the database design that is not possible from the DFD. [2]

7. Hash table has an index range of 1 to 400. The following pseudocode describes an algorithm for searching the table using a hashing method. It is assumed that the key is present in the table.

1. index = hash(key)
2. while table(index, 1) <> key
3. index = index + 1
4. endwhile
5. value = table(index, 2)

(a) Explain the purpose of:

- (i) line 1
- (ii) line 2
- (iii) line 3
- (iv) line 5

in this algorithm.

[8]

(b) The algorithm fails to handle the upper limit on the range of the index. What modification to the algorithm is required to overcome this problem?

[2]

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