**HWA CHONG INSTITUTION**

**C2 PRELIMINARY EXAMINATION 2019**

**COMPUTING**

**Higher 2**

**16 September 2019 Paper 2 (9597 / 02) 1400 -- 1700 hrs**

Answer ***ALL*** questions.

Write your answers in the answer booklet provided.

You are reminded of the need for good English and clear presentation in your answers.

The maximum mark for this paper is **100**.

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

1. A bookshop wishes to expand its business from a brick and mortar shop to allow for online sales. A software company has been engaged by the bookshop to develop the online sales system.
2. The analyst decides to adopt a top-down approach to the design. What are the advantages of using top-down design to solve complex problems? [3]

The project manager decides to use some project management tool in the planning of the project. Below is the list of activities along with their required time for completion.

|  |  |  |
| --- | --- | --- |
| Activity | Expected completion time (day) | Preceded by |
| A | 2 | - |
| B | 3 | A |
| C | 1 | B |
| D | 3 | B |
| E | 4 | C |
| F | 3 | D |
| G | 2 | A |
| H | 5 | G |
| I | 3 | E, F, H |

1. Construct the PERT chart for the activities, indicating the earliest start time and latest start time of each activity. [3]
2. Which tasks are on the critical path of the Program Evaluation and Review Technique (PERT) chart? [1]
3. What is the slack time for Task C and G? [2]
4. 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]
5. 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]
6. 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?

[2]

(h) Produce a Gantt chart based on the above information. [2]

(i) Give **one** reason why a Gantt chart may be preferred over a PERT chart. [1]

1. Customers can view a catalogue of books and order from its website. Payment is made by the customer forwarding their credit card details, which are processed immediately. Details of the orders are matched against the stock file to check for availability of items before packing lists are produced and sent to the packing department.

(a) Draw a data flow diagram to explain the flow of data through this system. [6]

1. Using examples from your DFD, explain how the diagram helps to inform a database solution for the new computerized system. [4]

1. Give **two** parts of the database design that is not possible from the DFD. [2]
2. (a) Explain the difference between synchronous and asynchronous data transmission. [2]

(b) Describe the three modes of data transmission: simplex, half-duplex and full-duplex. [3]

(c) Give **two** advantages of packet switching over circuit switching. [2]

1. Sing Airline Company uses a website to provide ticket purchasing services to customers.

1. Customers are required to fill up a form with their name, passport number, hand phone number and flight information. Give **two** examples of data validation and **one** example of data verification for the company to validate the customers’ data.

[3]

1. Explain the purpose of using client and server scripting and give **one** scripting language for each. [4]
2. The company uses a web server to handle the customers’ orders. Describe **two** possible threats that the web server may encounter and suggest **one** strategy for each threat. [4]
3. Due to large amount of information to maintain and protect, the company is planning to use cloud computing to store and access data. Give **one** advantage and **one** disadvantage of using this technology. [2]
4. The company’s staff handbook must include rules and regulations for IT staff. Suggest **two** code of conduct for the company. [2]
5. Below is the manner in which the school library will process its overdue list:

* If a book is overdue then a reminder letter would normally be sent.
* However, if the book is more than 5 days overdue, 2 further checks are made to see whether the reminder should be replaced by a warning letter:
* If the student has had a previous warning letter the student will not only receive the warning letter but, in addition, a copy will be sent to the parents of the student.
* If the student has more than 4 books overdue, but no previous warning letter, the reminder letter is replaced by a warning letter.

1. Create a decision table showing all the possible outcomes and results. [4]
2. Simplify your decision table by removing redundancies. [2]
3. A company manages subscriptions to thirty different magazines. Customers can subscribe to receive one or more of the magazines.

* Each magazine has a category such as Gardening or Current Affairs.
* Each magazine has a subscription rate, which is the cost of subscribing to receive the magazine for 12 months.

Details of the subscriptions are to be stored in a flat file.

Magazine(MagazineID, MagazineName, Category, SubscriptionRate, CustomerID,

StartDate, EndDate, CustomerName, Address, PostCode, TelephoneNumber)

1. What is the difference between a flat file and a relational database? [2]

1. Identify and state **three** potential problems with the flat file implementation for the magazine subscriptions. [3]
2. Improved on the flat file and determine the relations needed in the relational database for the above. Explain the purpose of each relation. [6]
3. In what way can your database solve the three problems in **part (b)**. [3]
4. Draw the Entity-Relationship diagram between the relations you have in **part (c)**. Explain your answer. [6]
5. The algebraic expression X = 2 \* A + B could be held in a binary tree as:

=

X +

\* B

1. A

This tree can then be read using the following algorithm:

process left subtree

process right subtree

read root node

This will give X 2 A \* B + = which is the reverse Polish form of the expression.

1. Using diagrams to help the explanation, or otherwise, show how a computer can use a stack to evaluate the expression from its reverse Polish form. [4]
2. The tree in the example could be stored in an array called TREE.

|  |  |  |  |
| --- | --- | --- | --- |
| TREE [9] |  |  |  |
| TREE [8] |  | -1 |  |
| TREE [7] |  | 5 |  |
| TREE [6] |  |  |  |
| TREE [5] | 2 |  |  |
| TREE [4] |  |  |  |
| TREE [3] | X |  |  |
| TREE [2] |  |  |  |
| TREE [1] | B |  |  |
| TREE [0] | = | 3 | 4 |

The values in each location in the array are: node value; left pointer; right pointer. Where no left or right pointer exists the rouge value -1 is used. Copy and complete the array for the example. (Note that, since in the example there are only seven nodes, three rows of the array will be unused.) [5]

1. Draw a tree similar to the one in the example which would represent the expression:

Y = 2 \* (A + B) – (A ^ 2)

[3]

where x ^ y means xy.

1. Using the algorithm in the example, and your tree, write out the reverse Polish form of the expression in **part (c)**. [3]
2. Using the following numbers as an example, show how the numbers can be sorted in ascending order using a **quick sort**. For each pass, show the numbers swapped and the sub lists after splitting. [7]

435, 646, 344, 54, 23, 98