HWA CHONG INSTITUTION
C2 PRELIMINARY EXAMINATION 2014

COMPUTING
Higher 2

22 September 2014 **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. Hwa Chong has partnered with Q&M to set up a dental clinic in the Campus. The clinic will have a few dentists to serve the student population. The clinic will also have an on-line system for students to make appointment with dentist. You are task to design the on-line system to handle all student appointments.

(a) Draw an entity-relationship diagram for the appointment system. [7]

(b) Convert the entity-relationship diagram into a relational database schema. You may use shorthand notation to put across your answers. Be certain to indicate the key fields. Your solution should include a brief description for each table. [9]

(c) Ensuring data integrity and security is an important issue in data design. Explain why they are important for HC Dental system. [2]

(d) The school plans to extent the dental service to other users after the first year. Modify the entity relationship diagram to cater to the teachers and staff too. [3]

Besides the data design, the user interface is an important factor in determining the success of the HC dental system. The graphical user interface for students to make an appointment using their desktops/laptops must be intuitive and usable.

(e) Describe 3 design principles that will guide you in designing your interfaces. Give specific examples on how you will incorporate it into your user interface design for the HC dental system. [6]

(f) Design the user-interfaces for the following features

(i) On-line appointment booking [3]

(ii) Updating of students particulars [3]

(g) Part of the future enhancement of the system is to allow a multimodal interaction between the user and the system. A multimodal human-computer interaction usually involves the 5 human senses and enables a more free and natural communication. Suggest 2 realistic possibilities for such an enhancement. Your suggestions should include a brief description of how it works in this context. [4]

HC Dental system will reside in the school server and will allow access beyond the school intranet. Mr Huang, the network administrator has allocated an IP address 192.168.123.132 with a subnet mask 255.255.0.0 to access this system.

(h) Explain the following terms:

(i) IP address [1]

(ii) Subnet mask [1]

(i) Based on the information given, what is the network address? Show the workings. [2]

The management team is concern with the accuracy of data transmitted/received outside the school network. To ensure the team that they have looked into this area, the development team highlighted that they have use parity checks and checksums in detecting errors

(j) Explain parity checks and give an example to illustrate how it works. [2]

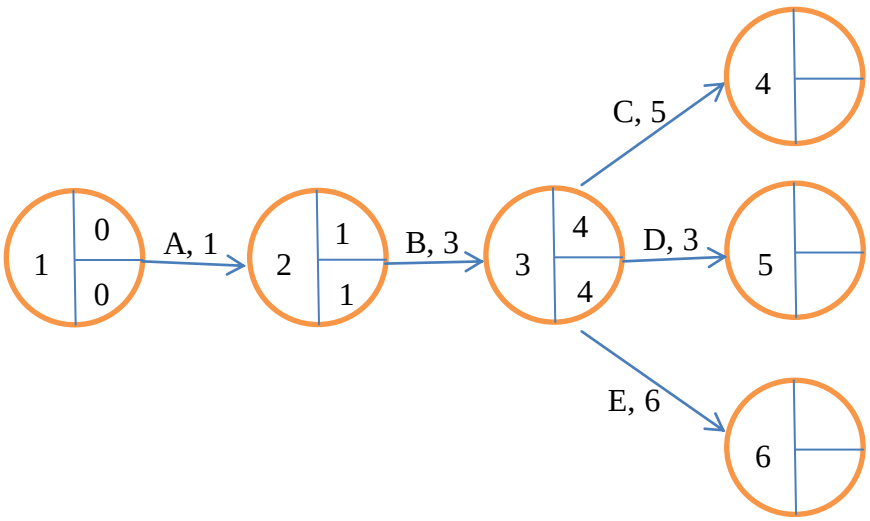
The network administrator highlighted that there are proxy and firewalls settings for devices accessing the school network.

(k) What is the purpose of a proxy server in the Network? [2]

2. (a) The Retail Company has engaged a software house to computerize its operations. The project has been defined to contain the following list of activities along with their required times for completion:

Activity	Description	Duration (Working Days)	Predecessor/s
A	Requirement Analysis	1	
B	Systems Design	3	A
C	Programming	5	B
D	telecoms	3	B
E	Hardware Installation	6	B
F	Integration	2	C, D
G	System Testing	2	E, F
H	Training/Support	1	G
I	Handover and Go-Live	1	H

(i) Complete the PERT chart below, indicating the earliest start time and latest start time of each activity:



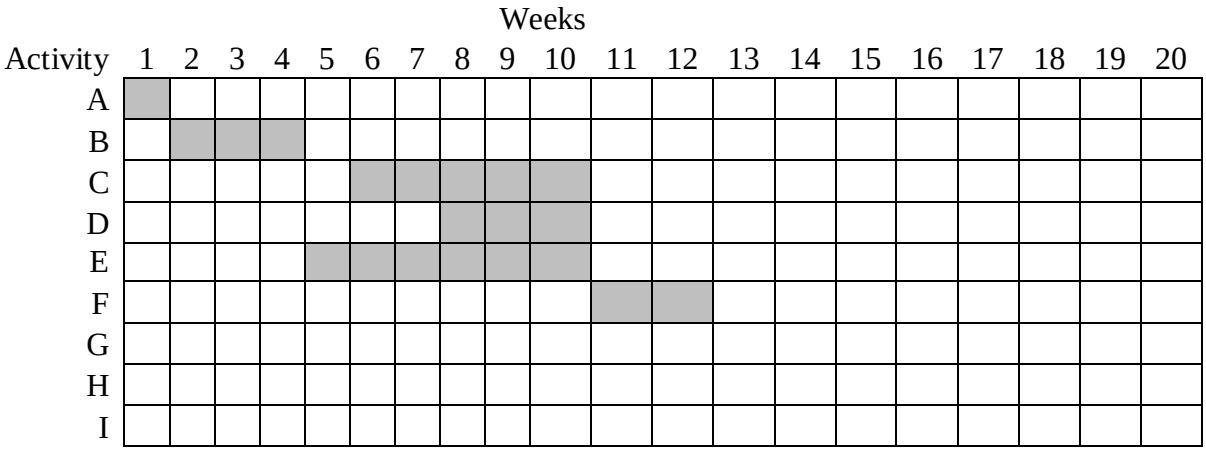
[4]

(ii) State the critical path. [1]

(iii) State the elapsed time of the project. [1]

(iv) State 2 activities not on the critical path, as well as their slack time. [2]

(b) The Gantt chart below is based on the above information. There are three activities missing and three activities shown are incorrect. Draw a sketch of the Gantt chart to show the correct version.



[4]

3. All's Well Hospital is in the process of computerizing its clinic processes. At the clinic, there are various doctors specializing in different areas e.g. neuroscience specialists, gynaecologists, etc. All patients of the clinic must be registered in the patient database and make prior appointments to see the relevant doctors. No walk-in patients will be entertained. Appointments are made based on the doctor's weekly schedule i.e. different doctors have clinic sessions at different day/time of the week.

On the day of appointment, patients are to register at the self-registration counter before proceeding to the doctor's room. Upon seeing the doctor, the doctor will input the diagnosis into the system. After the doctor's consultation, the patient is to proceed to make payment. Upon payment, a prescription slip, reference letter, medical certificate, will be printed as necessary for the patient. In addition, the next appointment may be scheduled, if necessary.

(a) Use a diagram to show the data flows, processes, data stores and external links in the system. [10]

(b) At the self-registration counter, patients can scan the barcode of their appointment card or NRIC. Alternatively, they can also enter their NRIC number using the keyboard. When the NRIC is entered using the keyboard, it must be validated and verified.

(i) Explain the difference between validation and verification of data. [2]

(ii) Describe two validation tests that can be performed on the NRIC number entered. [2]

(iii) Describe how the NRIC number entered by the patient can be verified by the system. [1]

(c) As part of the hospital welfare program, there is a fitness center for staff. To enter the fitness center, staff needs to use a swipe card together with a 4-digit PIN to gain access. Access is only allowed if there are fewer than 50 people already in the fitness center, in order to avoid overcrowding. Access is also restricted to one person per card. If maintenance is being carried out then access is denied and a message is output to a screen asking the staff to return in 1 hour. In order to exit the fitness center, the swipe card is used again. Using appropriate variable names, write in pseudocode, an algorithm to control the entry system to the fitness center. [8]

4 A Retail Company has a customer loyalty program that gives a range of discounts. For customers in the loyalty program between 5 to 9 years, they will receive a 5% discount. For 10 or more years, the customer will receive a 10% discount. However, whether a customer is in the loyalty program or not, if the cumulative value of his purchases for this calendar year exceed $1000, he will receive a 15% discount.
Note: Aggregation of discounts is not allowed.

(a) Create a decision table that shows all possible outcomes for the above loyalty program.

(b) Draw the decision table after redundancies have been removed.

[6]

(c) Using your answer in (b), write a function using pseudocode. The function returns:
- 0 to indicate no discount
- the percentage discount offered

[4]

5. An apartment block in a city consists of a large number of apartments. Each of the residents of the apartments has their information stored in a file.

The records in the file are to be sorted into alphabetical order of the resident's name.

(a) Using the following list of names as an example, show how the records can be sorted into alphabetical order using an insertion sort.

GRA, CHR, DAV, SAR, TOM, KAT [4]

(b) Residents sometimes make requests for maintenance on their apartments. Each request is given a priority number ranging from 1, for failure of the air conditioning, to 10, for a dripping tap. Each request is stored in a linked list in order of priorities. Jobs with equal priority are stored in order of the date that they have been submitted.

Describe an algorithm to insert a new job into the list. [6]

--- THE END ---